THE METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER, THE ELECTRO-PLATERS REVIEW, COPPER AND BRASS
A TRADE JOURNAL RELATING TO METALS AND ALLOYS

OLD SERIES
VOL. 17. No. 3.

NEW YORK, MARCH, 1911.

NEW SERIES
VOL. 9. No. 3.

SOME REMARKABLE PARSONS MANGANESE BRONZE ROD FORGINGS

A Description of the Manufacture of Metal Stems for the Closure Gates of the New York City Water Supply.

The recent forging of twenty Parsons No. 1-A manganese bronze rods by the Wm. H. Cramp & Sons Ship and Engine Building Company, Philadelphia, Pa., marked another achievement by this company in the working of Parsons manganese bronze. The Metal Industry in the issue for October, 1910, contained a description of the casting of a large Parsons manganese bronze propeller wheel and remarkable as was that performance, it must now be said that it has been eclipsed by this later undertaking. The Parsons manganese bronze rods which are included in Contract 41 of the New York City Board of Water Works are 20 in number, and are known as main stems for the closure gates of the Ashokan Reservoir water supply scheme. These rods, when finished, will weigh nearly 5,000 pounds apiece, and will be from 22 feet to 30 feet in length and 6 inches in diameter. They will have cut on them a thread 17 feet 6 inches long with two threads to the inch, and known as a 29° acme thread.

FORGING A 6,000-POUND BILLET OF PARSONS NO. 1-A MANGANESE BRONZE AT THE FORGING PLANT OF WILLIAM CRAMP & SONS SHIP AND ENGINE BUILDING COMPANY, PHILADELPHIA, PA. FOREMAN F. TRIPP SHOWN IN THE FOREGROUND DIRECTING THE WORK.

MAKING THE ROD.

In manufacturing these manganese bronze rods, three stages of operation are noticed. The metals entering into the composition of the manganese bronze rods are melted carefully, mixed and then poured into iron ingot molds. Every detail as to obtaining an accurate composition according to the requisite formula is most carefully observed, both chemical and physical tests are continually being made of the material as it is being produced.

For the manufacture of such large work as these rods, which is the subject of this article; billets are first made by melting down the ingot and pouring into molds of the requisite size. The billets for these bronze rods were

cast in cylindrical iron molds made in two halves and held together with bands and wedges, and they produced a billet which was seven feet long, tapering from sixteen inches in diameter at one end to thirteen inches at the other. On the smaller end of the billet was cast a sinkhead, which was of the same length as the diameter of the billet, viz., thirteen inches. This sinkhead was designed to take up all the shrinkage and dross so that the billet itself would be composed of clear, sound metal. Of course the sinkhead, on the completion of the forging, was cut off as scrap.

After the billet was cast it weighed, together with its sinkhead, six thousand pounds, and some of the physical characteristics are shown in the following table:

AVERAGE TESTS FROM PARSONS MANGANESE BRONZE NO. 1-A.

	Ingots.	Billets.	Forgings.
Tensile strength.....	78,500 lbs.	69,500 lbs.	75,000 lbs.
Elastic limit.....	36,800 lbs.	30,550 lbs.	37,500 lbs.
Elongation in 2".....	35.0 per cent.	42.5 per cent.	37.5 per cent.
Reduction of area..	33.5 " "	40.0 " "	36.0 " "

It will be noted in the above table that while the tensile strength is somewhat higher in the cast ingot than the billet, this is due to the fact that the billet after being cast in the chill mold was machined off to a depth of one-half inch in order to eliminate any possible inequalities on the surface. This machining insured a billet of sound, smooth surface, free from any impurities such as dross which might have gotten into the mold with the casting, but at the same time the hard skin of the billet had been removed and consequently its tensile strength was somewhat lowered as shown by the table. It will be noted by referring to the table that the tensile strength, etc., are greatly increased in the subsequent forging of the billet.

A PILE OF 6,000-POUND PARSONS NO. 1-A MANGANESE BRONZE RODS ROUGH FORGED READY TO BE TURNED OFF.

FORGING THE METAL.

The illustration, Fig. 1, shows the operation of forging this tremendous billet of Parsons manganese bronze. The operation of forging this billet was accomplished in three heats. The billet was put into an annealing or muffle furnace, operated by coke. For the first heat the center of the billet was heated until it was of a good cherry red color, which would correspond to a thousand degrees Fahrenheit. The billet was then placed under the hammer and forged down to the required diameter, six and one-half inches, being continually turned by means of dogs clamped on the ends and which were turned by the workmen. The first forging lengthened the center section of the billet to twelve feet with a diameter of six and one-half inches. After this center portion had been forged down it was necessary to cool it off completely before putting the billet back into the furnace, for the metal at what is known as the black heat state is like so much molasses candy, and would cause considerable trouble by reason of its tendency to become twisted out of shape while the unforged end was being heated in the furnace. This cooling was accomplished by playing over the surface of the metal the nozzle end of a hose through which compressed air was forced, this operation taking one-half hour.

The billet was then put back into the furnace and the end opposite the sinkhead end was heated to the required temperature, which consumed an hour and a half. The second operation of the forging then took place and lengthened out the billet twelve feet more, after which it was again cooled by the compressed air and the sinkhead end put back into the furnace. The third and last operation of the forging then took place, and the billet was lengthened eight feet more, when the sinkhead was cut off, leaving a completed rod thirty-two feet long, and six and one-half inches in diameter. In our illustration we show the twenty-four foot rod with its unforged end of about three feet resting on the anvil and the hammer ready for the last forging. It can be seen how easily this unwieldy piece of metal was handled by the workmen in charge; the hammer man is seen with his hand on the lever which releases the hammer, and lets the steam into the steam hammer under such pressure as to produce a three-ton blow, but he can so regulate the pressure as to let the heavy hammer softly tap the heated metal and gently coax it into the required shape. A steel block is placed on the anvil which prevents the hammer from reducing the billet beyond the required diameter, and so accurate was this seemingly rough work performed that the observer could not detect the strike of the hammer on the block more than a few times during the entire operation. After the billets are forged into what are to the forging man finished rods, but from an engineering standpoint are really very crude material, they are taken to the machine room, placed on a large lathe and the surface is then turned off with mathemat-

ical precision to the finished size, which will be six inches in diameter.

DESTINATION OF THE RODS.

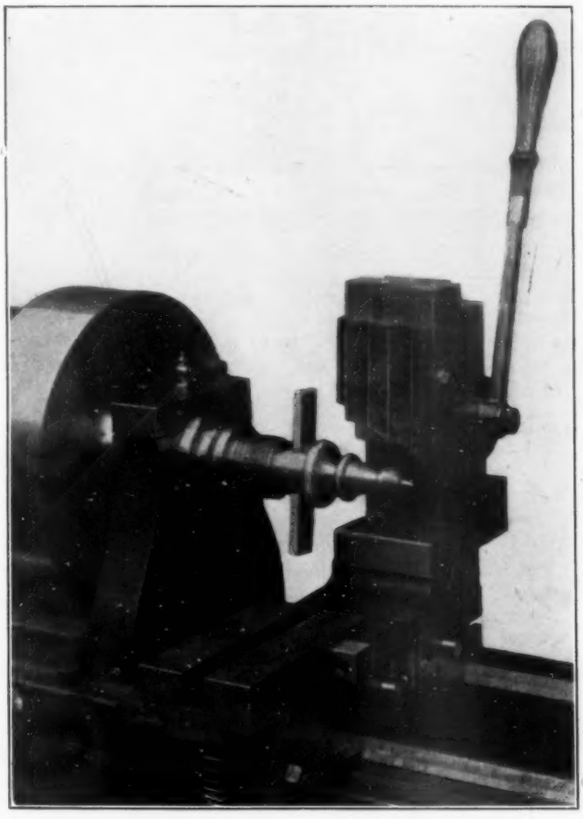
The total weight of these rods, which are twenty in number, in the rough forgings amount to 115,000 pounds, and it is estimated that the weight of the finished shipment will be in the neighborhood of 80,000. Our second illustration shows the pile of these rods after the forging, waiting to be sent to the machine room for final finishing. These rods, as remarked at first, are intended as a part of the equipment for the New York City Water Supply Reservoirs. Four of these rods will be finished with a length of thirty feet, ten inches, with a diameter of six inches, and will be used in the closure gates of the Ashokan dam. Eleven of them will be finished at thirty feet, ten inches long, six inches in diameter, and will be used in the gates of the effluent chamber at Hill View Reservoir, and five finished at twenty-two feet, ten inches long, six inches in diameter, for use in the influent chamber at Hill View Reservoir.

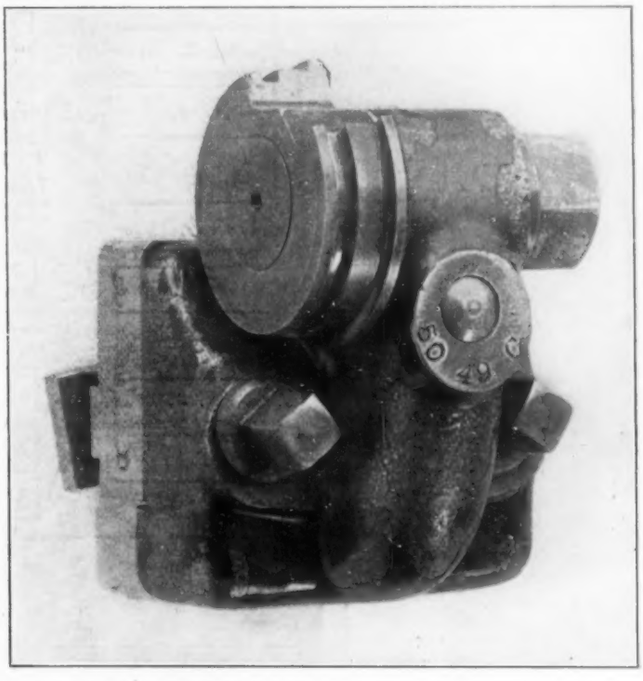
FORMING TOOLS AND THEIR USE

By Toolmaker.

Ever since the introduction of the forming tool into the brass industry toolmakers all over the country have been divided as to what type of tool to use and in what position it will do the best work.

The two forming tools most commonly used are the round and the flat, the latter is probably the most common and does better work, although the round tool is extensively used in some shops because it is easier to make and easier to keep in order. It consists of a piece of tool steel turned to fit the outside pattern of the work desired to be finished, a groove is then ground across the tool at an angle of 90 degrees, the same as the flat tool.





TWO EXAMPLES OF FORMING TOOLS IN EVERY-DAY USE.

The front edge of the groove constitutes the cutting edge of the tool, it is then set on a spindle in front of the cross-cut carriage in the same position as it was turned and revolved with a lever in front of the work.

There is one thing in favor of the flat tool and that is that it can be set in a perpendicular position. The advantage of this is apparent in the fact that the working pressure on the bearings of the lathe is downward while the pull of the belt is bringing the wear of the spindle on the top bearing. It will readily be seen, therefore, that this equalizing of the pressure on the bearings, not only lessens the possibility of chattering, but also prolongs the life of the lathe bearings. With the round tool the working pressure on the spindle must be upward the same as when the flat tool is set in an horizontal position, thus bringing double pressure on the top bearing of the lathe. There are some toolmakers who insist that anything in the shape of turning can be done satisfactorily with the forming tool, but there are some classes of work that require special treatment before the forming tool is drawn across it.

Take, for instance, an ordinary globe valve disk or a ground joint swivel; if the castings happen to have any flat spots in them, which is often the case, it is necessary to keep a keen edge on the tool all the time. Otherwise it will be found that the tool has slid nicely over the flat spots, which only the grinding in of the joints will reveal, and as many shops do not grind these joints and valves before they are sent out, the result is leaky joints, numerous complaints and loss of trade. To overcome this difficulty some put a "roughing off" tool, for just the joint, in the lathe turret so as to make the joints round before using the forming tool, and in this way eliminating the troublesome flat spots which are as hard to turn out on the speed lathe as to grind out with the planisher.

THE ELECTRIC INSTALLATION IN PLATING ROOMS.

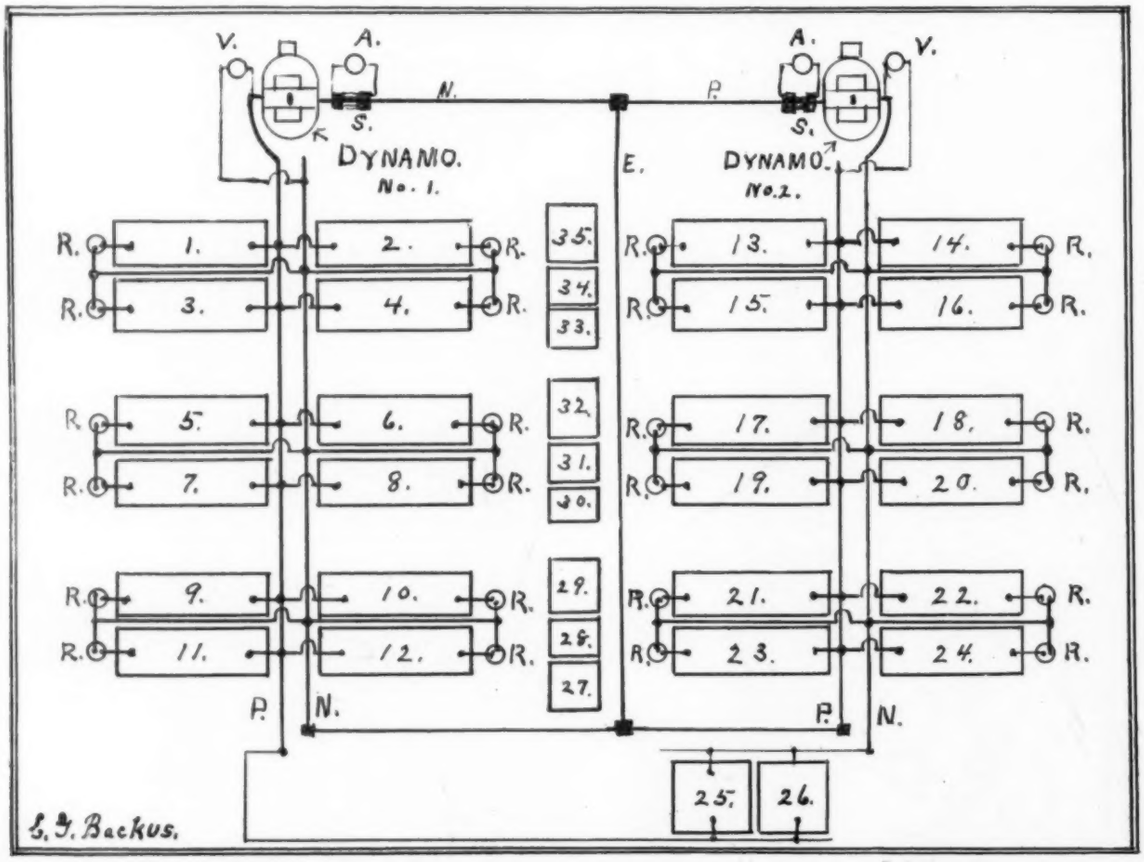
A Suggested Method for the Equalization of Voltages for Various Groups of Plating Tanks.

By C. G. Backus.*

C. G. BACKUS.

When large quantities of work of a similar character are handled in a plating room and uniform results are desired, the voltage must be uniform at each tank holding or containing the same kind of solution. In the example selected here, a number of tanks containing nickel solution are to be used, and at the same time there are several tanks containing cyanide of copper solutions, also some mechanical plating tanks, both of these groups of tanks requiring a different voltage from the group of nickel tanks. In the ordinary installation all these tanks would probably be coupled or connected to two main conductors running down through the room. The location of tanks being a matter of some chance, the last tanks put in being usually placed at the greatest distance from the dynamo, without reference to the fact that there is a considerable difference between the strength of current available at a tank near the dynamo and a tank located at the end of the line.

The dynamo would be built or would be made to run at the speed required to furnish the highest required voltage, and the different tanks which should have a lower voltage than the highest would depend on tank switchboards for this regulation. The suggestion made here is shown on the drawing, and is to use two dynamos, one of which has a higher voltage than the other. Group the tanks requiring about the same voltage together and place them all so that they will be near the cleaning tanks and with proper space for the operators to pass between.



This drawing shows two dynamos of different voltage connected together on an equalizer line showing three groups of tanks having a different voltage for each group.

A = ammeters, S = ammeter shunts, V = voltmeters and R = tank-rheostats or switchboards.

Plating tanks No. 1, to 12, inclusive are in circuit with dynamo No. 1 (6 volts, 2,500 amperes), and are composed of cyanide of copper, brass and bronze solutions.

Plating tanks Nos. 13 to 24, inclusive, are nickel, silver, tin and acid copper solutions, and are in circuit with dynamo No. 2 (3 volts, 2,500 amperes).

Plating tanks No. 25 and 26 are mechanical plating tanks in circuit, with both dynamos and having their combined voltage.

Tanks No. 27 to 35 inclusive contain hot and cold water, lye and platers' compound.

The main line conductor marked E, is common to both dynamos, being connected to the negative pole of terminal dynamo No. 1, and to the positive pole terminal of dynamo No. 2, and corresponds to the so-called neutral line of a three wire system dynamo.

In this plan every tank in each group is of equal voltage, as its circuit, is of equal length to the circuit of each of the other tanks in the same group.

*Of the firm of Backus & Leeser, platers' supplies, New York.

In running or installing the main conductors the suggestion is made to run an equalizer line for one of the conductors, down through the room and back to the vicinity of the generator, making all connections to this conductor on the return part. This plan will allow the same strength of current for each tank so connected to each dynamo, because each tank has the same length of circuit. In the example given here a conductor common to both dynamos is used as an equalizer line to save cost of conductors, although distinct conductors could be used for each dynamo.

The arrangement of conductors for mechanical plating tanks No. 25 and 26 is entirely different from those of the other tanks, as they are not on the equalizer line but receive the combined voltage of the two dynamos. For convenience of illustration only, these two tanks are shown at one side of the drawing, whereas in practice they could be placed in any convenient location. Rheostats or switchboards are shown at each tank, but if the solution and kind of work in each group of tanks were the same and the generators made with fields separately excited and governed by field rheostats the dynamos could furnish the exact force of current required without regulating each tank or set of tanks by the tank rheostat.

If the work is suitable a plan of installation on these lines can point the road to economy, both in fitting up and operation. It costs money to have workmen take needless steps while doing work and it is needless waste of horse power to cut down the energy used in plating by passing the current through a resistence board in its path to the plating tank. If a six-volt current is cut down to four volts in this manner there is a direct loss of thirty-three and one-third per cent., which is given off in radiated heat at the point where the resistance is inserted and when the strength of current is cut down from six volts to two volts this loss is doubled. As it requires approximately double the horse power to run a dynamo generating 6 volts 1,000 amperes compared with a dynamo generating 3 volts 1,000 amperes, it is logical to recommend a plan which generates about the voltage required. This does not imply that tank switchboards or rheostats should be abolished in a plant of this character; on the contrary it is well to have them installed in all tanks so that when the solution or the work of any tank or tanks is slightly different from the others of the same group, this difference can be adjusted.

THE USE OF SAWDUST AS A DRYING MATERIAL.

By Charles H. Proctor.

MACHINERY IN PLACE OF SAWDUST.

In recent years a number of inventions have been placed upon the market in an effort to overcome the use of sawdust in drying metallic articles of various descriptions. Two of the most important are the centrifugal dryer, and a combination of the centrifugal and hot air dryer. The first depends upon its high speed of rotation, which throws the moisture to the outer edge by centrifugal force. The second method is an improvement of the first, due to the additional drying agent of hot air, ranging from two to three hundred degrees under pressure. The centrifugal force expels and the hot air blast absorbs the remaining moisture, so this invention has proved remarkably successful as a dryer for many articles, but unfortunately their application is limited. Articles that contain deep depressions or those that contain only one outlet cannot be successfully dried by these methods. The articles do not change their positions in centrifugal dryers and for this very reason articles that contain depressions will retain their moisture and for this reason these machines have not proved themselves satisfactory for all purposes.

THE SUCCESSFUL DRYER.

The successful dryer must be a combination of centrifugal and reciprocal so that the position of the articles can be changed, with this combination it would be possible to overcome the difficulties enumerated. It would be well for the manufacturers of such machines to take notice, because until the disadvantages noted have been overcome the centrifugal machine will be limited in its applications and cannot therefore prove itself a commercial success. In the meantime the electroplater must continue the use of the older method of using sawdust as a drying material for many articles. Of the woods available for this purpose there are very few species that give the requisite combination to produce the desired results. These are boxwood, maple, rock maple, poplar and Northern pine (free from resin). The majority of other woods available are either too hard, contain resin or tannin and are therefore not satisfactory for the purpose. Sawdust containing resin adheres to the articles when heated. Woods containing tannin produce discolorations by the absorption of moisture and continued heating develops tannic acid; therefore a decided disadvantage accrues from their use. The sawdust resulting from maple or rock maple should be given the preference as these woods contain all the advantages for a drying material, being neither too hard for absorption of the moisture and containing none of the detrimental influences noted in other wood. Sawdust is a cheap source of drying material and in many plating establishments serves a threefold purpose:

DRYING MATERIAL.

First, as a drying material, in connection with the boiling water or soap solution, the use is continued until the absorption of moisture is not satisfactory. This is noted by its tendency to cling to the articles when drying out. When this occurs it should be used for the second purpose, which is in drying out articles cleansed by the aid of benzine or gasoline. Its use is continued until it becomes too impregnated with polishing material such as tripoli, Vienna lime or rouge compositions. Third, its use may be further continued in dry tumbling, and for this purpose it will be found very satisfactory owing to the polishing material it contains. After this it can be used for first operations in tumbling for such articles that have a small amount of oil upon their surface.

Maple sawdust usually comes in three grades: No. 1 for fine work, such as jewelry, etc.; No. 2 for ordinary work and is known as the medium grade; No. 3 which is coarser and is used upon articles that are dried without the use of sieves. It can be readily seen that sawdust is a cheap source of drying material when used to its fullest extent. It is oftentimes difficult to obtain the material on account of the demand. There are a number of concerns that make a specialty of this material.

CURRENT FOR BLACK NICKEL SOLUTION.

The current of a black nickel solution should not be too strong or grayish tones will result. The solution works best neutral or slightly alkaline. Sheet brass anodes give better results than nickel.

PATENT CONTROVERSY OVER BEARING METALS

THE CONTINUATION OF AN INTERESTING DISCUSSION WHICH WAS STARTED BY THE READING OF A PAPER AT THE CINCINNATI CONVENTION OF THE BRASS FOUNDERS' ASSOCIATION, MAY, 1909. EIGHTH PAPER.

BY G. H. CLAMER.

Continuing the discussion in connection with the controversy over bearing metals, which has for over a year past appeared in the columns of THE METAL INDUSTRY, Mr. A. Allan, Jr., in the July number produced some photographs and analyses of copper-tin-lead bearings which contain tin in excess of the amount represented by the proportion of 9 tin to 91 of copper, as called for by the literal interpretation of the patent claims covering plastic bronze. These bearings, he produced not by ordinary foundry practice which the patent calls for, but by a special method or process or the addition of another substance or substances, which he designates as "Allan's Process" and from his deductions covering the production of bearings of such composition in this manner he arrives at the conclusion and attempts to convince the readers of THE METAL INDUSTRY that his father, A. Allan, Sr., invented not only the alloys of copper with high percentages of lead for which I have already given him credit, but also the class of copper-tin-lead alloys covered by our plastic bronze patents. He also states that the principles underlying the production of such alloys as claimed in our patent are incorrect. He furthermore challenges the fact that such alloys can be made by following the claims of the patent, *i. e.*, by controlling the proportions of tin and copper and so holding up the lead without recourse to some special process or added substance or substances, as in the "Allan Process," he making the claim that it is only by means of this process that such alloys can be produced.

FIG. 1. MIXTURE IN CRUCIBLE.

Copper	61.50
Tin	10.00
Lead	27.50
Sulphur	1.00

FIG. 2. MIXTURE IN CRUCIBLE.

Copper	56.50
Tin	10.00
Lead	32.50
Sulphur	1.00

FIG. 3. MIXTURE IN CRUCIBLE.

Copper	65.00
Tin	5.00
Lead	30.00

I apologize for my tardiness in answering this attack, but I did not wish to do so until I had inspected the bearings which Mr. Allan has exhibited at the office of THE METAL INDUSTRY. Each time I have been in New York, I have either forgotten or not had the time until a few weeks ago. Having examined these bearings, I find them, from external appearance, to be good bearings, showing no "lead sweat" whatever. The backs, as would be expected, however, are scruffy and porous, resulting from the use of sulphur as shown by analysis of Ledoux & Company, the amount of sulphur shown, averaging in the two bearings .88 of 1%. It can be safely assumed all this sulphur is in combination with copper, hence it is readily figured from the formula $Cu_2 S$ that the bearings contain 4.37% copper-sulphide, a brittle, friable substance of lower specific gravity than the alloy. Because of its low specific gravity, this copper-sulphide floats in a great measure to the top of the castings, giving the bearings the appearance above noted. This matter of sulphur, however, is only a side light on the discussion, but it is quite evident that sulphur is a very important factor in the "Allan Secret Process," as I have already pointed out early in this controversy.

The question now arises, does this either alone or in combination with some method or other addition, have influence upon the amount of lead which can be added to copper-tin alloys, when tin exists in so high proportions that it is no longer possible to make the alloy by ordinary methods, *i. e.*, simple melting and pouring without special additions or treatment? The bearings exhibited by Mr. Allan show no "lead sweat," therefore, Mr. Allan has actually produced bearings so far outside the limits of our patents, so far as proportion of tin to copper is concerned that he has proved that sulphur or the "Allan Process" has had an influence on retaining the lead in such alloys.

In the May number, I made the following statement:

"Should he, Mr. Allan, be able to make such mixtures (those which he now shows in July number) by means of 'Allan Process,' I will freely grant he is able to do something by this process which cannot be accomplished by ordinary foundry practice." I have reproduced the bearings as made by Mr. Allan, by the simple addition of sulphur. No special treatment was given the alloy either in melting or casting. Stick sulphur was used for introducing the sulphur, and was added by plunging it beneath the surface of the molten alloy by means of a small inverted graphite crucible attached to an iron rod.

The bearing made after Ledoux analysis No. 1 is shown by photograph No. 1, the mixture entering the crucible being as follows:

Copper	61.50
Tin	10.00
Lead	27.50
Sulphur	1.00

The bearing made in accordance with Ledoux analysis No. 2 is shown by photograph No. 2, the mixture entering into the crucible in this case being:

Copper	56.50
Tin	10.00
Lead	32.50
Sulphur	1.00

It will be seen these bearings show no signs of "lead sweat," but an examination of them will also show the effects of sulphur as above described. This proves absolutely that sulphur is the agent which prevents segregation in such alloys, nothing else is necessary. Should the "Allan Secret Process" consist of anything outside the addition of sulphur, the further addition of any other substance or any special manipulation is immaterial. The field is open to all to make alloys containing percentage of tin in excess of approximately 9 to 91% copper by this means. I maintain, however, and believe that the courts would sustain me, that the addition of sulphur or any other element, or the practice of any special manipulation is immaterial in the manufacture of alloys as described in our patent, because such treatment or addition is unnecessary, and would consequently simply be an attempt to evade the patents. The alloys we describe, as I have tried to point out repeatedly in this discussion are made by every-day foundry practice.

The resulting bearings were very sound and showed no indication whatever of lead segregation. The resulting bearings were perfectly sound and there was no indication of "lead sweat." The proportions of the component metals used in these experiments are typical proportions as called for by the patent in suit."

This point can be verified by Mr. Allan or any foundryman without any difficulty whatever, and I am surprised that Mr. Allan at this late day should raise any question concerning it. He certainly would not have done so had he performed the experiment. Notwithstanding Mr. Allan's statements to the contrary, the amount of lead which can be held up within a copper-tin alloy *is dependent upon the amount of tin present.* The theoretical point is 9% tin to 91% copper for approximately 20% lead when following commercial practice, *i e.,* presence of small amount of impurities, such as zinc, iron, etc. With the pure metals, the critical point can be passed with lower lead alloys, without causing segregation. It would be ridiculous to suppose that an alloy of 73% copper, 7% tin and 20% lead would not exhibit "lead sweat," whereas one composed of 72.9% copper, 7% tin and 20.1% lead could no longer produce satisfactory bearings.

It can be readily understood that a small proportion of low melting point constituent might be present without effecting to any serious extent the solidification of the whole bearing. The amount of tin which can be present with various percentages of lead without causing "lead sweat" is shown by the curve in diagram No. 4. If impurities are present, the allowable amount of tin becomes less.

FIG. 5. (SHOWS LEAD SWEAT.)

Formula:

Copper	58.50
Tin	6.50
Lead	35.00

FIG. 6. (SHOWS NO LEAD SWEAT.)

Formula:

Copper	57.50
Tin	6.50
Lead	35.00
Sulphur	1.00

FIG. 7. (SHOWS LEAD SWEAT.)

Formula:

Copper	62.50
Tin	7.50
Lead	30.00

FIG. 8. (SHOWS NO LEAD SWEAT.)

Formula:

Copper	61.50
Tin	7.50
Lead	30.00
Sulphur	1.00

Photograph No. 3 is a bearing made in accordance with one of our standard formulæ, *i. e.,*

Copper	65.00
Tin	5.00
Lead	30.00

Millions of pounds of such bearings have been made by us. In verification of the fact that such bearings are made without any special treatment or addition, I give below extract from the testimony of Dr. A. Sauveur, Professor of Metallurgy, Harvard University, who has already several times been quoted in this discussion.

"Q.—Have you followed the description of the patent in suit practically and what result, if any, did you get?

A.—I have made to that effect a number of experiments at the works of the Ajax Metal Co., with the following results:

Melt marked No. 1-300 lbs. of metal, we melted in the following proportions and cast into bearings in the usual manner:

Tin	5.00%
Lead	30.00%
Copper	65.00%
	100.00%

Agreeable with Mr. Allan's request, I am sending to the office of THE METAL INDUSTRY, bearings of the following compositions:

Copper.	Tin.	Lead.
67	9	24
70	10	20
65	5	30

the other two alloys, which he specifies, *i. e.,*

Copper.	Tin.	Lead.
58.50	6.50	35.00
62.50	7.50	30.00

I am unable to produce without the addition of sulphur. By including these two in my former statement, I was quoting from memory, but I have since had access to my notes, and also attempted to produce these bearings without success. The simple fact that the latter composition will segregate when 7.50% tin is present and will produce

a perfect brass with 5% tin present, conclusively shows that tin beyond certain limits produces lead segregation.

Photograph No. 5 is a bearing made of the former composition.

Copper	58.50
Tin	6.50
Lead	35.00

Photograph No. 6 is a bearing of the same composition, in which 1% of sulphur has replaced copper. Photograph No. 7 is a bearing of the latter composition.

Copper	62.50
Tin	7.50
Lead	30.00

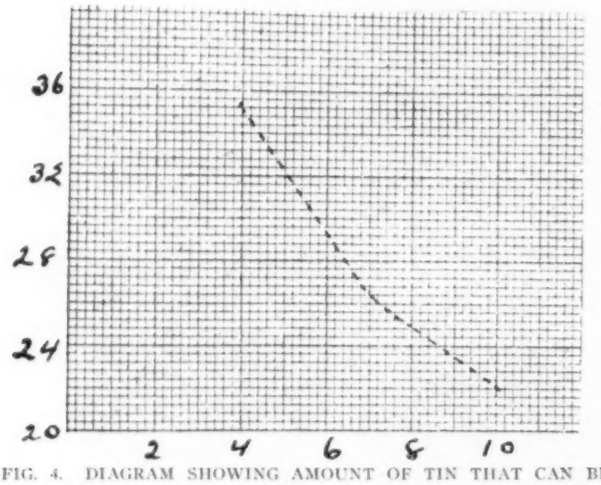


FIG. 4. DIAGRAM SHOWING AMOUNT OF TIN THAT CAN BE PRESENT WITH VARIOUS PERCENTAGES OF LEAD WITHOUT CAUSING LEAD SWEAT.

and photograph No. 8 of the same composition with 1% sulphur replacing copper. It will be seen without the addition of sulphur these compositions segregate badly, whereas bearings containing 67% copper, 9% tin and 24% lead, and bearings containing 70% copper, 10% tin and 20% lead, show no segregation whatever. It is not necessary to exhibit photographs of these, but they are on exhibition at the office of THE METAL INDUSTRY.

Again referring to Haycock & Neville equilibrium diagram, tin and copper alloys which has figured largely in this discussion and reproduced in the July number, Mr. Allen rightly states that the 9% tin alloy has greater freezing range in degrees than alloys with more tin or less tin. This is quite evident from a perusal of the diagram, and very satisfactorily explains why with less than 9% tin, more lead can be added. As to the temperature range on the other side of the line, Mr. Allan entirely loses track of the fact that the alloy remains for a proportionately longer time in liquid condition at a temperature of 790 degrees (represented by the line, B. I. C., depending on the excess of tin above 9%. Dr. Sauveur has stated, as I have already quoted, "It can be calculated that the solidification period of an alloy with 15% tin is roughly four times longer than with 5% tin, hence the much greater power of the latter alloy of retaining lead while solidifying by denying the necessary time for that metal to segregate." Alloys containing less than 9% tin solidify at relatively higher temperatures depending on the diminution of tin in the alloy.

Notwithstanding Mr. Allan's assertion that Point "B" is only a so called critical point, it is nevertheless a true and well substantiated critical point conceded by the highest authorities, and it is hardly to be supposed that it is influenced to any material extent by the presence of lead, because that element does not enter into actual combination with the copper and tin constituents, as is revealed by the microscope. It is true that it may be shifted by the rate of cooling, but this does not alter the fact that it is a true critical point. No chemical change takes place in a whole mass instantaneously—time is always a factor in such changes.

The cooling curve of alloy 65 copper, 5 tin and lead 30, made by Messrs. Sauveur & Boylston, Metallurgical Engineers, of Cambridge, Mass., as shown in Diagram No. 9, completely disproves Mr. Allan's assumption that lead affects the complete solidification of the copper-tin matrix. It is easily calculated that the matrix of the 65-5-30 alloy referred to is in the proportion of 5 tin to 65 copper, or 1 tin to 7.69 copper. The matrix of this alloy, as will be noted by referring to the cooling curve, begins to solidify at 960 degrees C., with a maximum retardation of 953 degrees C.

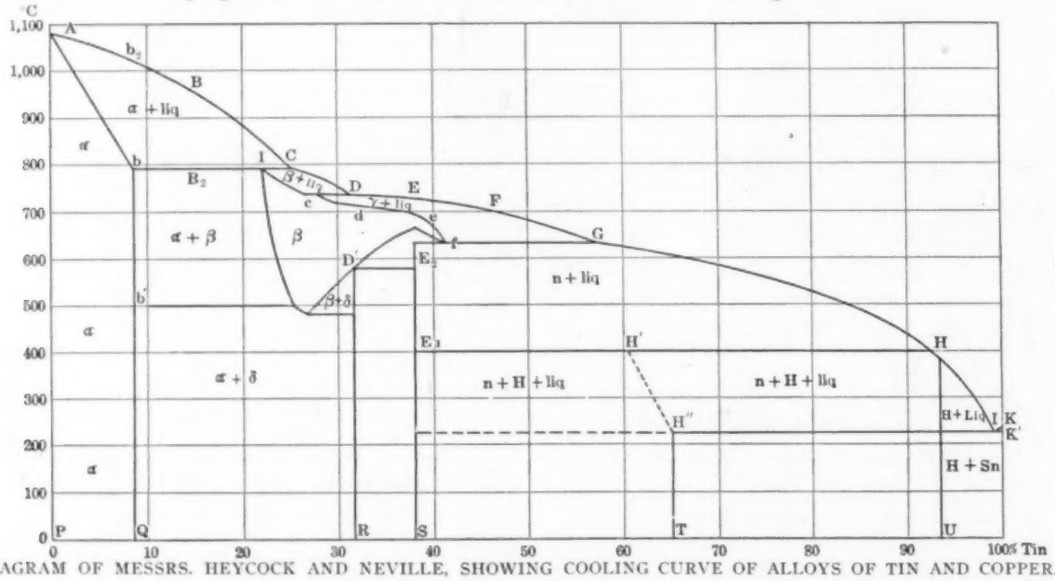


DIAGRAM OF MESSRS. HEYCOCK AND NEVILLE, SHOWING COOLING CURVE OF ALLOYS OF TIN AND COPPER.

By referring to the Equilibrium Diagram of Heycock & Neville we learn that copper-tin alloy of these proportions begins to solidify at about 1,025 degrees C., and is completely solidified at about 810 degrees C. The Heycock-Neville figures are the result of extremely slow cool-

ing (about two hours), and, therefore, no doubt very accurately give figures for beginning and ending of solidification.

The curve of Messrs. Sauveur & Boylston was made by bringing the alloy to the liquid condition and then, without artificial means, allowing it to cool in the ordinary room temperature. This gives for the ending of solidification of the matrix a temperature of 910 degrees, fully 100 degrees higher than called for by Heycock & Neville diagram, so that, I believe, it is quite safe to infer that lead at least does not lower the point of complete solidification of the matrix to any material extent. The other stop in the curve with maximum retardation of 350 degrees represents the solidification of the lead constituent.

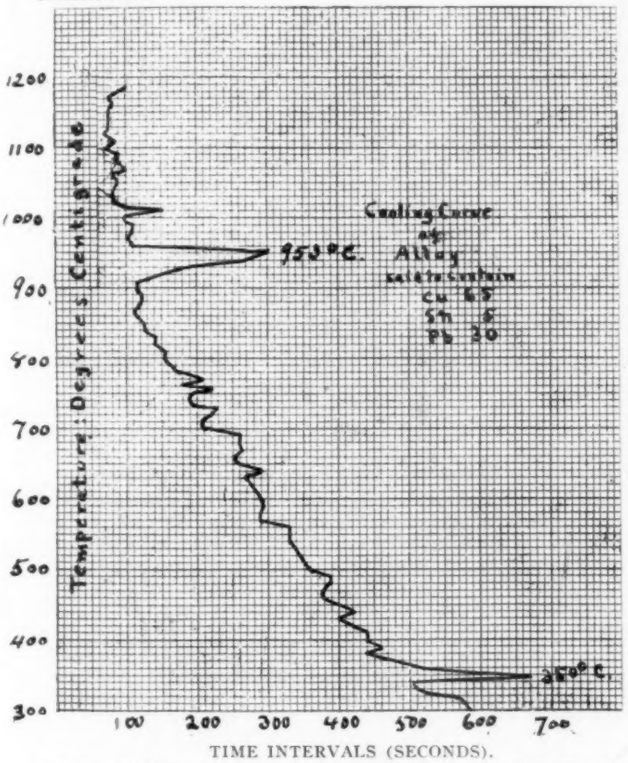


FIG. 9. COOLING CURVE OF SAUVEUR AND BOYLSTON, BOSTON, MASS., FOR COPPER, TIN AND LEAD ALLOY.

Mr. Allan has drawn from his discussion certain conclusions, which I will tabulate below with my answers in condensed form opposite, so that the readers of this paper may draw their own conclusions respecting the relative merits of the arguments as presented.

CONCLUSIONS.

BY MR. ALLAN.	BY MR. CLAMER.
1. Does not the presence of the eutectoid of Cu 4 Sn in the Allan bronzes, referred to in my February paper show that the critical point of the copper-tin series can have no bearing on the lead content of the alloy? In other words, does not the presence of the eutectoid wholly disprove that a critical point has been established between tin and copper, which is necessary to make possible high percentage of lead?	1. The presence of Cu 4 Sn as shown in the Allan bronze exhibited, undoubtedly shows that the critical point of the copper-tin series has been passed. As I have shown, in making the alloys from pure metals, it is possible to pass the critical point without lead segregation in the lower lead content alloys. Mr. Allan has used an entirely different means of preventing segregation, i.e., sulphur, and the segregation of lead, is therefore, not dependent at all upon the proper proportioning of the copper and tin constituent. Under the circumstances, I fail to see how he has proved his point. On the other hand, believe I have proved that tin beyond certain limits in such alloys, produces lead segregation when ordinary foundry practice is followed.
2. Does the fact that the Haycock-Neville curve shows change in construction at 9% tin, influence the amount of lead which can be added to copper-tin alloys without showing segregation? Also is this change of such a nature that it causes an abrupt change in the copper-tin-lead series?	2. I have shown, notwithstanding Mr. Allan's statement to the contrary, that the amount of lead which can be added to a bronze *is dependent upon the amount of tin present.* The Haycock-Neville curve is the most satisfactory explanation of why this is so. At least it is the best theory which has yet been presented. An inventor is not required by law to state a theory correctly, and the one stated in the patent is the most satisfactory to account for the underlying facts which are in reality the subject of the patent.
3. Should an alloy of 15 parts of tin to 85 parts copper, having a freezing range of only 170 degs. Cent., allow any more or as much segregation when lead is introduced, than an alloy of 9 parts tin to 91 parts copper, having a freezing range of 230 degs. Cent.?	3. Although the alloy of 15 parts tin and 85 parts copper has a freezing range of only 170 degs. Cent., and the alloy of 9 parts in tin to 91 parts copper has a freezing range of 230 degs. Cent. Mr. Allan, as I have pointed out in this discussion has overlooked the fact that the 15% alloy remains for a long time liquid at 790 degs. It is the time element at this freezing point that allows the lead to segregate.
4. Does not our alloy prove that the time interval b to B2 has no effect on giving an opportunity to the lead to separate out?	4. As the "Allan Alloy" has been made with sulphur, it has no bearing whatever as an argument, to disprove the point involved, i.e., that the time interval has the effect of giving an opportunity to the lead to separate.
5. Hence, we must conclude this series of alloys depends upon how to control the lead, which is the Allan process, and is applied to copper without and with tin up to amounts beyond the practical limits for hardness and not upon the critical point of 9 parts tin to 91 parts copper in the mix.	5. In accordance with plastic bronze patents, the control of the lead is by maintaining a certain correctly proportioned matrix of tin and copper. Alloys so made require no special manipulation or addition of other elements. The "Allan Process," or addition of sulphur, as I have shown, is advantageous for preventing the segregation of lead when the matrix is made up of tin-copper alloy, in which the tin exists in higher proportion than called for in our patent.

SUMMARY.

This controversy or discussion arose originally from a paper which the writer prepared for the meeting of the American Brass Founders' Association held in Cincinnati, Ohio, in May, 1909. In this paper the writer outlined the "Patent Situation in the United States Respecting Alloys" and referred particularly to our plastic

bronze case, as this was the only alloy patent which has been before our courts. Mr. Allan has been endeavoring to convince the public that his father, Andrew Allan, Sr., was the inventor of such alloys, and has repeatedly made the statement that it was only after the Allan metal, a copper-lead alloy, had become generally known throughout the United States as a commercial product that plastic bronze, a copper-lead-tin alloy, was placed upon the market. This is a true statement and the writer has never attempted to contradict it for one minute, but he strongly maintains that the two alloys are just as different in character, as for example, cupronickel and German silver, one of these alloys consisting of copper and nickel and the other copper, nickel and zinc. Surely there is just as much distinction between alloys of copper and lead and copper-tin-lead, as there is between these two alloys mentioned.

I have thus far failed to get acknowledgment from Mr. Allan that he produced, prior to 1898, alloys of copper-tin-lead within the limits of our plastic bronze patent. In fact, all his literature up to about the time this controversy began implicitly stated that Allan metal contained no tin whatever. This is surely prima facia proof that his alloys were not of such a nature that they anticipated our patent. Now we find Mr. Allan producing copper-tin alloys by means of sulphur addition, somewhat outside the limits of our claims, i. e., having a matrix which contains tin in excess of the proportions called for in our patent, advertising them generally, and making claims for the superiority of such alloys which we fail to find substantiated by any tangible data. The writer does not dispute that Mr. Allan has a perfect right to make such an alloy, which is outside the claims of our patent—this field is open to all—but that such an alloy should be superior to those of lower tin content is contrary to well-established facts.

The load required to produce compression increases with the tin content. The coefficient of friction, as I have shown by tests made ten or more years ago, also diminishes somewhat with increased tin content, but here the superiority of high tin content alloy ends. The rate of wear, as well as liability toward heating under aggravated conditions, diminishes with the diminution of tin content, and these are the two prime properties to be considered. The amount of tin present in the alloy should be no higher than just sufficient to give the alloy sufficient rigidity to stand the load and strains which it is called upon to encounter in service without compression. To go to high tin content alloys is to go back to what might be considered ancient practice in the manufacture of journal bearings.

The bearings from which the photographs published in this article were taken are at the office of "The Metal Industry," where they may be inspected and analyses made by any one interested.

This discussion was started in 1909, and began with Andrew Allan, Jr.'s, discussion published in "The Metal Industry" July, 1909, of G. H. Clamer's paper on "The Patent Situation in the United States Regarding Bearing Metals," read at the Cincinnati Convention of The American Brass Founders' Association in May, 1909. In all eight papers, including the one here presented, have been published, and taking them all together, some very interesting and valuable information regarding lead-tin-copper alloys has been given. Of these papers Mr. Clamer and Mr. Allan have each written four, and the end apparently is not yet. Four of these papers were published in 1909—July, August, September and November; three in 1910—February, May and July; and one so far in 1911. As it is not probable that this controversy will be published in separate form, we would advise those of our readers who are interested in bearing metals to send in their orders for bound volumes without delay, as the supply will soon be exhausted.

So far no one outside of the original debaters has taken part in the discussion, but we would remind our readers that the columns of "The Metal Industry" are open for dispassionate discussion and anyone can air his views.—Ed.]

PATTERN SHOPMATES.

By W. H. Parry.*

There's the good old "rummy," who of us have not met him, with a breath and person redolent of fumes acquired by several bumpers of cheap whiskey or beer. He is always alluded to as a first-class man, though it is seldom so, his reputation having been built up at the several groggeries graced by his presence between jobs. I remember a specific instance of the versatility of one member of this Y. M. C. A. group when one day on visiting our shop while "well corned," became so boisterous in the absence of the boss that he entertained the force by sitting astride a fiery sawhorse, meanwhile singing "I want to be an angel, and with the angels stand." Then there is the rusher who starts every job on the run, and winds up on a very slow walk because of his wonderful aptitude in making more mistakes in one hour than he can rectify in two; and then holds out both hands for his pay, flushed with the supreme consciousness of having done the concern good and brown.

Occasionally we have the would-be tough huggermaguffin, who calls the foreman "the old guy wot has a pipe," and is given to bragging about his conquests with the females whom he meets in picnic parks and cheap ballrooms, as he is wont to do in his spare time. Needless to say, this species of ape is a nuisance in a pattern shop, as the fit of his dancing pumps and clothes are of far more importance to him than good patternmaking ever can be. Next we have the grandiloquent specimen who condescends to receive instructions from the foreman with a patronising air, after assuring him at every opportunity of the many places of which he has had charge before stooping to accept a place at the bench and then proceeds to botch his job with all possible despatch.

Again, we have the dreamy-eyed individual who discourses beautifully on metaphysics and Christian Science, and who is wont to indulge in language that for verbosity is in a class by itself—as his pattern work is likely to be—though rather than hurt the feelings of other disciples of Mother Eddy I'll not tell what the class ought to be. And last, and least, there is the cigarette fiend, man or boy, whose hands and brain are stained with the tell-tale marks of his over indulgence in "coffin nails," and conveying the absolutely correct information that his brain is also stained by Prince Nicotine, and whose career is interspersed by long waits between jobs, inexplicable as it seems to him.

FLEMISH IRON FINISH.

Flemish iron is produced upon imitation hammered iron work by coating with dead black Japalac, drying, then rubbing down with emery and a little oil. The surface is then acquired to protect against rust. This is used largely upon antique hanging lamps, old armor, etc.

* Superintendent National Meter Company, Brooklyn, N. Y.

GREAT CAST BRONZE MEMORIAL DOORS

The pair of bronze doors shown in the illustration were recently cast at the bronze foundry of Jno. Williams, 556 West 27th street, New York City, and are an excellent example of a sculptured bronze casting.

The doors are for the main entrance to the Fairhaven Memorial Church, of Fairhaven, Mass., given by the late H. H. Rogers to the Unitarian Society of Fairhaven, Mass.

These doors were designed by the architects, Messrs. Brigham, Coveney and Bisbee, of Boston, Mass., and the statuettes were modeled by Mr. F. Kirchmayer, sculptor, also of Boston. The designs of the architects were carefully put into form by skilled modelers, and after two years of work were cast.

The casting of these doors was a difficult task and represents a remarkable piece of foundry achievement. They were cast in two leaves, each fourteen feet high and four feet wide. Each leaf, with the exception of the statuettes, was cast in one piece and weighs two and one-quarter tons; but in spite of this weight, they swing easily on specially constructed hinges. The stiles and rails of the doors are 8" thick and cast hollow. The rest of the doors, including panelling, moldings, etc., were cast solid, these parts being about ¾" thick. Both inner and outer faces of the doors being undercut in many places, the mold was prepared by the method technically called "piece cored." The mixture comprising the bronze of which the doors are cast is a regular statuary bronze of copper, 90; zinc and tin, 10. The total cost of these doors is estimated to be in the neighborhood of fifty thousand dollars.

CAST BRONZE DOORS, MEMORIAL CHURCH, FAIRHAVEN, MASS.

The design of the doors is based upon traditions of English Gothic of the last or perpendicular phase. The composition is one of two principal parts corresponding to the two folds of the doors, but it is intended to produce the effect of a single unit of design when the doors are closed. The architectural and sculptural treatment of the faces of the doors is of the utmost richness and elaboration. The central feature on the outside is a figure of Christ in the act of benediction, set in a niche and sheltered by a canopy of intricate design bearing four angelic heralds proclaiming the Gospel Message to the four quarters of the world. Two banners at the sides of the central niche bear as an inscription the Gospel Message, "Behold I bring you good tidings of great joy which shall be to all people, for unto you is born this day in the city of David, a Saviour." The central figure is flanked on either side by three of the Apostles, six in all on the outer face, the other six being placed in corresponding positions on the inner face of the doors. The Apostles carry their symbols and beneath each is a shield bearing the symbols in low relief. In this series St. Paul appears in place of Judas Iscariot.

Forming a frame around the doors on both the exterior and interior is a series of canopied niches filled on the exterior with figures representing great characters in the history of Christianity. The period from the beginning of the Christian era to the Reformation is represented by great men of the Catholic Church; The Post-Reformation period by great reformers, members of the various Protestant bodies.

On a ribbon directly beneath the symbols of the Apostles appears on the exterior the legend, "Behold I stand at the door and knock, if any man hear my voice and open the door I will come in to him and will sup with him and he with me." In a corresponding position on the interior the legend reads "I am the door, by Me if any man enter in, he shall be saved and shall go in and out and find pasture."

Directly beneath these inscriptions is a series of corbels from which spring the tracery members, bearing various types of crosses which have been used in Christian Art.

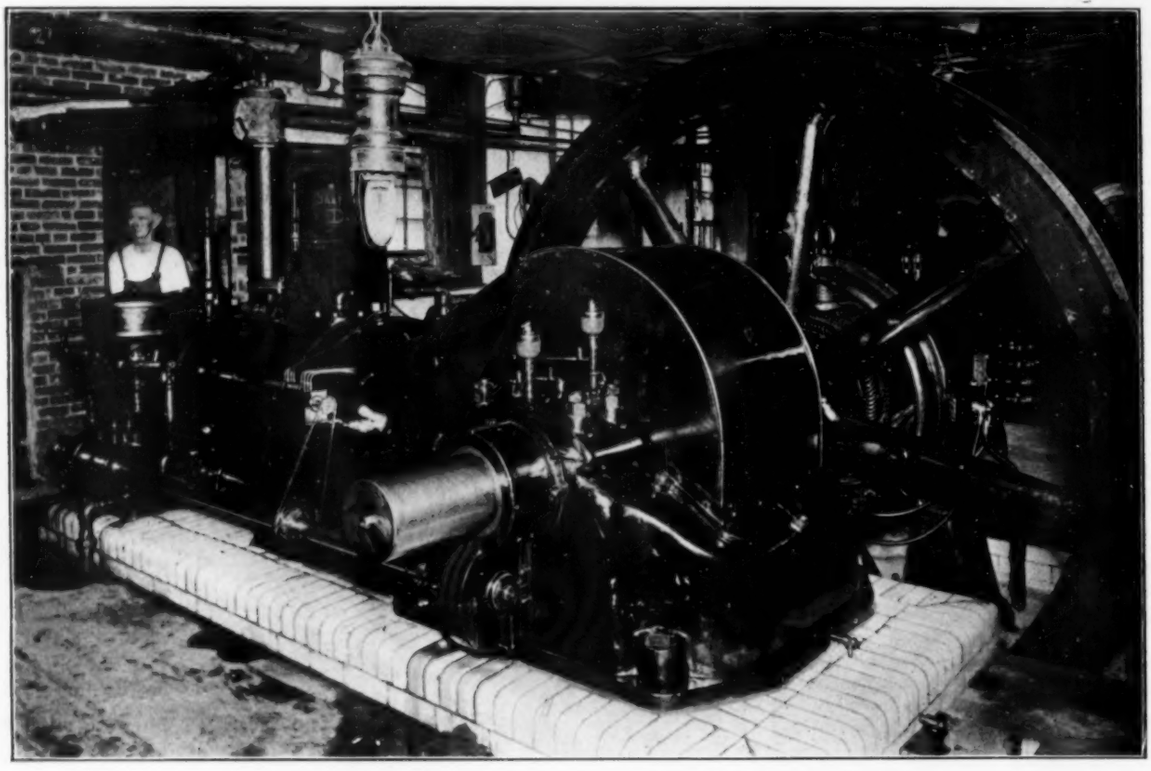
The doors are to be hung in the outer opening of the southeast porch of the Memorial Church, erected with others of the group of buildings, of which it forms a part, in 1904. In the loggia, or cloister of the same church, were placed two bronze gates, which were also cast in the foundry of Jno. Williams, Inc., of New York, in 1905. These gates were in every way equal in design and workmanship to the great doors.

A GAS ENGINE INSTALLATION

A Description of an Economical Power Producing Plant.

A notable gas engine power installation is shown in the accompanying photograph. This is an "Otto" suction gas producer and engine, installed in the plant of The Manhattan Screw and Stamping Company, West End avenue and 67th street, New York City. The plant was installed by The Otto Gas Engine Works, builders of gas producers and engines, of Philadelphia, Pa. The installation shown in the cut furnishes 105 horse power to the plant at a cost of practically one-half of the cost for steam power.

The principal features of the "Otto" suction producer which make the low operating cost possible are: There is no costly steam boiler or large and expensive gas holder required, and the apparatus is arranged so that the gas generated is always under less than atmospheric pressure, thus making escape of gas into the room through leaky joints impossible. The inhaling action of the engine is used to draw the air and steam necessary for generating the gas through the producer, in quantities required and regulated by the power developed.



A 105 HORSE POWER GAS ENGINE WITH GAS PRODUCER INSTALLED IN THE PLANT OF THE MANHATTAN SCREW AND STAMPING COMPANY, NEW YORK.

The plant consists in the main of the producer, scrubber, gas receiver and the gas engine, all being properly connected by pipes and fittings. The producer is a cylindrical stove lined with fire brick with a grate below and a coal-hopper and a charging device above. The method of generating suction producer gas in the "Otto" producer is as follows: Air is drawn through the bed of incandescent fuel, by the action of the engine piston, thus forming combustible gas. The gas generated in this manner, while passing under or around the water contained in the evaporator, imparts heat to this part of the apparatus, generating steam. The air, before entering the space under the grate, is saturated with this steam, and the moist air is decomposed while passing through the hot fuel bed, adding a certain amount of hydrogen to the gas. The gas thus produced has a heating value of approximately 130 to 140 B. T. U. per cubic foot. Leaving the producer the gas enters the bottom of the scrubber, filled with coke, and in passing upward meets a spray of water which purifies and cools the gas, before it is led to the gas receiver and thence to the engine. The scrubber water carries most of the impurities in the gas to the sewer. A small amount of silt or mud is left in the bottom of the scrubber, and can be easily removed every few months. The gas connection between producer and scrubber is positively shut off by a three-way cock when the engine is not running.

The total amount of water consumed by the producer and engine is approximately 10 gallons per horse-power hour. In case of scarcity of supply, the water, after being properly cooled and purified, can be used over again, thus limiting the quantity used to the small amount lost by evaporation. Outside of the usual small amount of care required to keep the engine in order, the labor expended in operating the "Otto" suction producer is limited to keeping the producer free from clinkers, removing the ashes and filling the hopper with coal when needed. The actual time spent in this way should not exceed 2 to 3 hours per day, according to the size of the plant.

When stopping the plant, the generator is shut off from the scrubber and opened to the atmosphere. The natural draught keeps the fuel burning moderately, so that the producer can be put in operation again within a short time.

A comparative table of the cost of fuel per brake horse power for ten hours is as follows:

Fuel.	Price of Fuel.	Fuel Consumption Per Brake H.-P. 10 Hours.	Cost of Fuel Per Brake H.-P. 10 Hours.
Gasoline	10c. per gallon.	1.25 gallons	12.5c.
Illuminating Gas	$1.00 per 1,000 cu. ft.	180 cu. ft.	18c.
Natural Gas	25c. per 1,000 cu. ft.	130 to 160 cu. ft.	3.25 to 4c.
Producer Gas, Anthracite Pea Coal	$4.00 per long ton	12½ lbs.	2.24c.
Producer Gas, Charcoal	$10.00 per ton	12 lbs.	5.35c.
Bituminous Coal, Ordinary Steam Engine	$3.00 per ton	80 to 100 lbs.	10.7 to 13.4c.*

*When using steam there must be added the cost of attendance (engineer and labor in hauling fuel and ashes) which in any gas engine plant is practically eliminated.

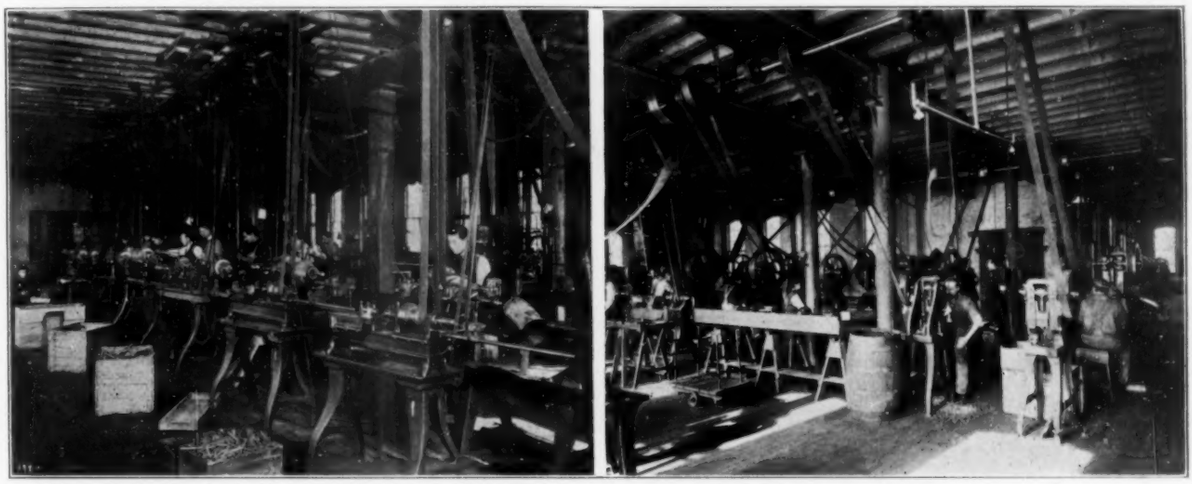


FIG. 2. VIEW OF AUTOMATIC SCREW MACHINE ROOM. VIEW OF PRESS ROOMS.

THE PLANT OF THE MANHATTAN SCREW AND STAMPING COMPANY, NEW YORK.

FUEL.

A most satisfactory and generally available fuel for the "Otto" suction producer is anthracite pea coal. When using coal of suitable quality, the fuel consumption is guaranteed not to exceed 1¼ lbs. of coal per brake horse-power hour during full load run for plants above 50 horse power, and 1½ lbs. for smaller plants, though actual practice has shown considerably more favorable results. Based on the above guarantee with coal costing $4.50 per long ton, the cost of the fuel for plants above 50 horse power would be ¼ cent per brake horse-power hour. In most localities suitable coal can be bought at still lower figures, while even in places further away from the anthracite fields where this fuel is necessarily more expensive, the economy of the "Otto" suction producer and engine is still very pronounced.

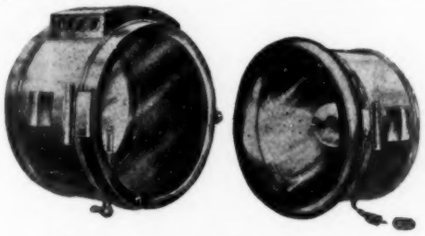


FIG. 3. THE PHOEBUS HEADLIGHT.

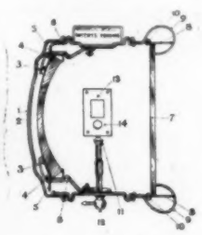


FIG. 4. DETAIL OF PHOEBUS.

Charcoal, which in many districts is the cheapest fuel to be obtained, has proven to be an almost ideal fuel for the "Otto" Suction Producer. It requires less attendance, there are almost no ashes, and the power developed per pound of fuel is fully as much as with the best grade of anthracite. When charcoal is to be used a special charging hopper is furnished.

Clinkers and ashes can be removed without interrupting the working of the producer, an additional distinct advantage over the pressure producer.

There being no moving parts to the producer, the wear and tear incident to the operation of the gas plant is limited to the action of the fuel upon the fire brick lining and the occasional giving out of a grate bar. The lining of the producer consists of fire brick made of highly refractory material, and with ordinary care and a fair grade of coal will last two to four years, when it can be renewed.

APPLICATION OF THE OTTO GAS ENGINE.

The Manhattan Screw and Stamping Company are operating with the installation described above at a coal consumption of 900 pounds for 64 horse power in 10 hours. The company manufacture a line of the well-known "Phoebus" automobile and motor boat gas and oil headlights, as shown in Figs. 3 and 4. They also manufacture tire pumps, acetylene generators, "Progressive" mantle caps, wire supports, inverted burners and mantle rings, etc. The company occupy a large seven-story building, and employ over 200 skilled mechanics. We show a view, Fig. 2, of the press room where the bodies and rims, etc., for the lamps are made, and also of the screw machine room where the rod, wire and tubing used in the manufacture of their products is worked up. In addition to the regular line of products mentioned the Manhattan Company makes a specialty of doing special work to order and are always ready to estimate on lamps, generators, etc., of difficult and intricate design.

INTERESTING BUSINESS ITEMS GATHERED FROM THE REPORTS OF OUR FOREIGN CONSULS.

INCREASED OUTPUT OF CHINESE TIN PROMISED.

[From United States General George E. Anderson, Hongkong.]

Shipments of tin from China, in which the United States is materially interested, are likely to be soon largely increased. Practically all the tin mines of the country are in Yunnan Province and the exports come almost entirely through the port of Mengtze and by way of Haiphong to Hongkong, whence they are distributed all over the world.

The mining heretofore has been altogether by native process and the output has been large in spite of the many drawbacks to the trade due to imperfect methods of production. Recently German interests secured concessions in the Province and a modern ore dressing and smelting plant is being installed and will soon be at work. The machinery has been purchased in Germany and has been carried to the vicinity of Mengtze by way of Haiphong and the French railway.

Chinese capitalists and officials have long considered the tin mines of Yunnan of more than ordinary importance in the development of that Province. At present the export of tin constitutes 93 per cent. of the trade of Mengtze, the principal port of the Province. The exports from all China during the past four years have been as follows:

	1906.	1907.	1908.	1909.
Value .	$2,783,067	$2,667,342	$2,913,986	$2,599,049
Pounds	9,053,177	8,196,790	10,635,345	9,931,775

About 97 per cent. of this tin on an average goes out of Mengtze, the balance through Wuchow and Kowloon, with a trifle now and then from Hankow. Practically all of it is handled through Hongkong. Tin shipments out of Mengtze now come out through the hands of Chinese merchants in return for inward shipments of cotton piece goods, cotton yarn, and the like. Tin comes down by the Red River or the French railway to Haiphong and thence to Hongkong, appearing in this market in the shape of crude slabs, which are remelted and refined here. There are several tin-refining establishments in Hongkong and they refine about 470 tons monthly. These establishments refine the crude metal received from Yunnan into 112-pound slabs of three grades, known as No. I, No. II, and No. III Yunnan tin and assaying 98½ to 99 per cent., 97½ to 98 per cent., and 95 to 96 per cent. pure tin, respectively.

AMERICA RECEIVES LARGEST PORTION.

In a general way about half the product of Yunnan received in Hongkong is shipped to Eurbpe and the United States and the other half to Chinese ports, but a very large portion of that shipped to Europe eventually goes to the United States; practically all orders here for delivery of tin in Europe carrying the option of delivery at New York. The use of the metal in Chinese ports is for various purposes not common in America and Europe. The largest consuming point in China is Ningpo, where the metal is beaten into tin foil and is used in the manufacture of token money.

Swatow, the second largest consuming point, uses a considerable amount of tin in pewter and other metal work, which constitutes one of the chief industries of the port. Hangchow, Foochow, and Amoy, in the order named, take considerable quantities of the metal for the manufacture of such money. The commercial value of the Yunnan tin shipped to the United States and Europe is below that of tin shipped to the same markets from Malaysia, which is now furnishing about two-thirds of the tin supplies of the world, the difference being due to the crude methods of refining the metal here. It is expected that the introduction of new methods and modern plants in Yunnan will remedy this condition and that metal produced under new conditions will come nearer absolute purity as established by the standards adopted in Europe and the United States.

CHINESE JEWELRY MADE IN GERMANY.

[From United States Consul J. C. McNally, Tsingtau, China.]

The power of German imitation is strikingly exemplified in a recent creation of jewelry embossed with Chinese characters signifying "longevity" and "good luck," heretofore exclusively manufactured by the leading Chinese firms of Canton and Hongkong, consisting of cuff links, watch fobs, cravat pins, brooches, and other articles. The German creation is of superior workmanship, although the grade of gold is greatly inferior, the German standard being but 14 carat, while that of the Chinese runs from 18 to 24 carat. The German manufacturers have outdone themselves in the creation of stone in actual representation of the jade stone of China. I am informed by a jeweler that the German article so closely represents the genuine Chinese jade that dealers themselves can be deceived. The leading Chinese houses are about to substitute these imitation stones in their mountings, and it behooves oriental travelers to remember this when purchasing jade ornaments.

A NEW METALLIC ROD PACKING.

[From United States Consul Wilbert L. Bonney, San Luis Potosi, Mexico.]

A new metallic rod packing has been successfully demonstrated in San Luis Potosi; after being subjected to a test of 27 months for piston packing of the Corliss engine of the local flour mill, in continuous operation, much of the time day and night, the packing shows no perceptible deterioration. It has also been demonstrated on two Cook consolidated locomotives, with Atlantic type piston rods and cylinders 21 by 30 inches, on the National Railways. The engineers in both cases state that they have not lost one minute's time on account of packing during these tests. The inventor was formerly master mechanic of the Central Railway of Mexico at this point and is a mechanic of 40 years' experience.

The packing consists of a tubular member adapted to surround a piston rod and of segmental floating rings of brass or cast iron, the rings being held against rotation by a bridge so constructed that when fluid pressure is upon the piston it will set up the packing about the rod; when such pressure is released upon the exhaust stroke the packing is released from the rod. The end joints of the various segments are so arranged that there can be no continuous opening from one end of the packing to the other. The packing falls away from the piston while drifting. It is claimed that the new packing is much more economical than existing methods, requiring less frequent renewal; that friction upon the exhaust stroke is nil, that the horizontal bearing is less subject to wear than a conical surface, and that these features, with the hardness of the metal employed, render it many times more durable than any packing in use. In the flour-mill test only cylinder lubrication was used.

THE MANUFACTURE OF WROUGHT BRASS

A Description of Modern Methods for the Production of Plate, Sheet, Rod, Wire and Tube.

(Continued from January.)

By L. J. Krom.

FINISHING THE BRASS.

The bar of brass is rolled out wider than the size or width required for the finished strip or sheet. This is done because the edges become ragged or serrated in the rolling, and enough margin must be left to allow for trimming to the required width. The operation of trimming is done on machines of the types shown in the accompanying cuts manufactured by the Waterbury Farrel Foundry and Machine Company, Waterbury, Conn. The machine shown in Fig. 18 is known as a single slitter, and is used for slitting long, thin metal sheets into strips by means of two circular knives or cutters, one strip only being cut off at each operation. The adjustable gage shown on the table determines the width of the strips cut off, and also acts as a straight edge to guide the work. Means are provided to take up the end thrust from the cutters, and adjustments are furnished to overcome the difficulty attendant on the regrinding and wearing of the cutters. The smallest size of this machine, as generally used, is not geared, but is driven by a pulley on the lower spindle; larger sizes have a back gearing, with cut gearing on a main drive and with cast pinions for connecting the two spindles. On machines for cutting very heavy work the spindle gears are generally designed so as to permit the use of cutters reduced in diameter by regrinding; when used on relatively thin metal this permits of a longer life for the cutters. Cutters are easily removed for regrinding.

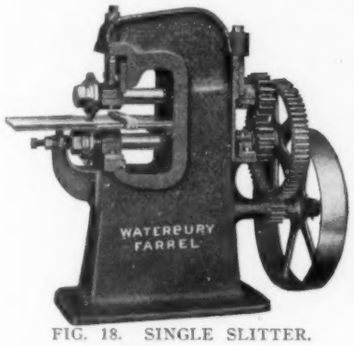


FIG. 18. SINGLE SLITTER.

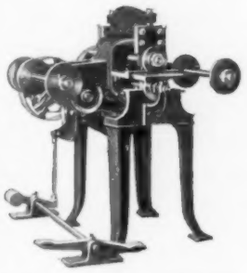


FIG. 19. SINGLE SLITTER WITH WINDING ATTACHMENT.

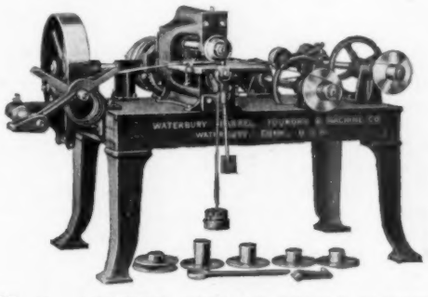


FIG. 20. ANOTHER TYPE OF SINGLE SLITTER.

Fig. 19 shows a winding adjustment added to one of the smaller single slitters. This winder is driven directly by a belt from a pulley on the back of the slitter. The wider flanges are adjustable to the width of metal used. The machine shown in Fig. 20 is another type of single slitter that has been designed by the manufacturers for shops cutting large quantities of metal into strips of many varying widths where each width is small in quantity; this presents a situation which is unsatisfactorily covered by a gang slitter or one that has a number of cutters on the same spindle on account of time required in changing the latter over from one width to another, the high class of labor required by the latter and the expense demanded by the many collars. The stock to be slit is placed on the reel at the left and is pulled by hand to the right over the table roll between the guides on the table and up to the bite of the cutters. These are revolving, and they bite the metal and separate it into two strips. The operator then stops the cutters while he fastens the front strip to the left-hand winder and the rear strip to the right-hand winder. Each winder is belt driven, with its own belt tightener, and handwheel for taking up the slack metal. The reel, table guides and rear winder are adjustable and will take metal up to four inches wide for the rear strip and four inches wide for the front strip. The rear guide is rigid, while the front is held against the work by the weights shown; the treadle withdraws the pressure while starting the metal. An overhead countershaft is used to control the machine in starting the metal.

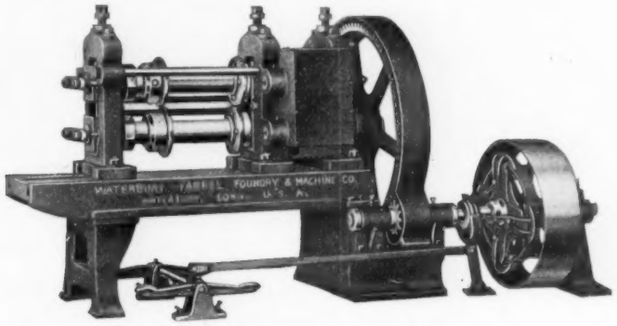


FIG. 21. TRIMMING MACHINE.

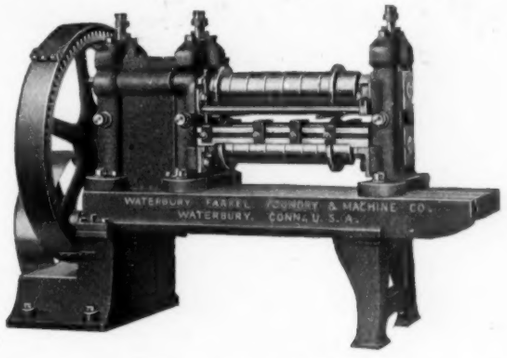


FIG. 22. GANG SLITTER.

Fig. 21 shows a machine designed for trimming

work only. It will cut both edges of a metal sheet twenty inches wide by the use of rotary cutters held in the adjustable heads shown. These cutters are hardened steel, and are so held on the two spindles that one pair of cutters is adjustable for different widths of metal. The upper spindle is adjustable; all gears are cut; a friction clutch is furnished with the machine. The trimmer is not adapted for use as a gang slitter.

The machine shown in Fig. 22 is known as a gang

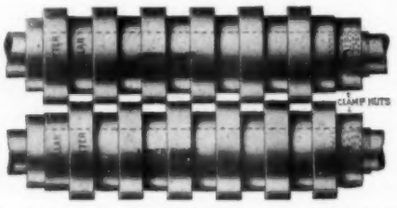


FIG. 23. COLLARS AND CUTTERS FOR GANG SLITTER.

slitter, and the arrangement of the cutters and collars used in the machine is shown in Fig. 23. The gang slitter is designed to slit metal into strips of exact widths, also to trim the edges of the sheets, and it has a nominal capacity of three cuts on brass or soft steel three-sixteenths of an inch thick, or six cuts on metal one-eighth inch thick. The cutter spindles are of crucible steel, the upper having ample vertical adjustment to bring the cutters into exact alignment. To change the cutters and collars or to rearrange them on the spindles the bolts holding the tail stand are loosened and it is moved to the right along the bed, thereby leaving the ends of the spindles accessible. The standard machine of the size shown is adapted for metal up to eighteen inches wide, but it may be built to order as desired up to thirty inches wide, providing a reduction in the maximum thickness rated is allowable.

DRYING OUT THE BRASS.

An interesting machine that is used very extensively in the manufacture of sheet brass is shown in Fig. 24, and is known as a drying-out machine. This machine

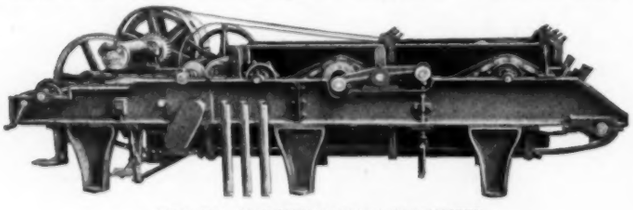


FIG. 24. "DRYING OUT" MACHINE.

will take metal up to fourteen inches in width, but may be constructed to take metal up to eighteen inches wide. Only two operators are required, and after starting one end of the sheet into the machine there is no handling necessary till the metal is coiled around the drum. One end of the metal is first passed for a few inches through the slot in the bar or "needle," which is then placed in lugs on the chains, while the remainder of the metal is placed in a loose coil in a tank (not shown) at the right-hand end. The drum operator then depresses the left-hand treadle and the chains start pulling the metal between rubber wipers and over felt rolls through a compartment filled with sawdust. Revolving brushes remove all foreign particles from the sheet. When the needle reaches the drum it is thrown automatically into hooks on the latter, which immediately starts rotating; at the same time the chain stops with its lugs in position at the tank end ready for another needle. When all the metal has been drawn through, the operator depresses the right-hand treadle and the drum stops and collapses, becoming smaller in diameter, so that the coil may be removed easily. The next piece can be started through, so that no time is lost.

(To be continued.)

AMERICAN BRASS COMPANY'S REPORT FOR 1910.

The American Brass Company reports for the fiscal year ended December 31 last net earnings of $1,264,581, as compared with $1,089,584 in the year previous; total expenditures $1,205,937 compared with $1,061,958, in 1909, and surplus of $58,644, contrasted with $27,626 in 1909. Net earnings of the subsidiary companies of the American Brass Company for 1910 amounted to $1,887,005, an increase of $119,459. Dividends received from subsidiary companies in 1910 amounted to $1,069,860, as against $1,075,481, in 1909, while the amount paid in dividends was $900,000 as compared with the same amount in the year previous.

The balance sheet of the American Brass Company, as of December 31 last, compares as follows:

Assets—	1910.	Changes.	
Cash	$58,644	Inc.	$31,018
Due from sub-cos.	2,304,756	Dec.	40,000
Accounts receivable	140,504	Inc.	81,104
Birmingham Brass invest.	.....	Dec.	108,161
Inv. cap. sub.-cos. stock	12,525,080	Inc.	25,000
Total	$15,028,984	Dec.	$11,039
Liabilities—			
Capital stock	$15,000,000		
Surplus	$28,984	Dec.	$11,039
Total	$15,028,984	Dec.	$11,039

The balance sheet of the subsidiary companies of the American Brass Company, as of December 31, last, compares as follows:

Assets—	1910.	Changes.	
Real estate, machinery, etc.	$9,182,414	Inc.	$145,434
Permanent improvements	20,884	Dec.	124,550
Cash	902,925	Dec.	180,577
Accounts receivable	3,976,375	Inc.	435,010
Bills receivable	421,819	Dec.	34,834
Stocks, other cos.	3,135,650	Inc.	5,250
Patents	1,000		
Merchandise	5,154,278	Inc.	322,797
Total	$22,795,345	Inc.	$568,529
Liabilities—			
Capital stock	$5,550,000		
Accounts and bills payable	1,689,856	Dec.	$208,616
Loans	2,304,737	Dec.	40,000
Contingency reserves	1,000,000		
Surplus	12,250,732	Inc.	817,145
Total	$22,795,345	Inc.	$568,529

The item "permanent improvements" in assets of the subsidiary properties is after deducting $400,000 charged off for depreciation.

At the annual meeting of the American Brass Company, held in Waterbury, Conn., February 7, 1911, the following officers were elected: President, Charles F. Brooker; first vice-president, Edward L. Frisbie; second vice-president, Alfred A. Cowles; third vice-president, James S. Elton; treasurer, John P. Elton; secretary, Gordon W. Burnham; assistant secretary, James A. Doughty; directors, C. F. Brooker, A. A. Cowles, J. S. Elton, Arthur C. James, John E. Wayland, C. H. Dodge, James A. Doughty, J. P. Elton, A. P. Hine, E. L. Frisbie G. W. Burnham, T. B. Burnham, T. B. Kent, Edward Holbrook, John J. Sinclair.

The Coe Brass Manufacturing Company, Torrington, Conn., has for its officers for the year of 1911 the following: President, Charles F. Brooker; vice-president, James A. Doughty; treasurer, Elisha J. Steere; secretary, George H. Turner; directors, Charles F. Brooker, Ansonia; E. J. Steele, James A. Doughty, George E. Cole, Torrington; A. P. Hine, James S. Elton, John P. Elton, Waterbury.

SHRINKAGE OF THE ANTIMONY-LEAD ALLOYS AND OF THE ALUMINUM ZINC ALLOYS DURING AND AFTER SOLIDIFICATION*

By Donald McEwen, M.Sc. (Birmingham).

(Concluded from February.)

PART II.—THE ALUMINIUM-ZINC ALLOYS.

Various reasons appeared to indicate the aluminium-zinc series as an interesting one to investigate in succession to the antimony-lead alloys.

More particularly, reference may be made to the increasing industrial importance of this series, and to the fact that the equilibrium diagram indicates the existence of mutual solubility of the two metals.

Shepherd (10) has conducted a microscope and pyrometric research on these alloys, the results of which are included in his equilibrium diagram (Fig. 1). He did not obtain the solidus curve, however, and as this is not known at present, it is hoped that additional interest will attach to the present work.

The aluminium-zinc alloys had been partially investigated by Mr. F. D. Simpson, a former research scholar of this university, who carried out an unpublished series of tensile tests, and also took some curves with the dial extensometer already described. Only a few of his results are to hand, and he seems to have failed to observe any expansions with the alloys, with the single exception of that containing 90 per cent. aluminium. As the accuracy of these curves was doubtful, it was decided to test them by repeating one or two of the castings. Bars containing 5 per cent. and 35 per cent. aluminium were therefore cast, and an expansion was recorded in each case by means of the mirror extensometer, which will be described later. In consequence the aluminium-zinc series of alloys was adopted for investigation.

PREPARATION OF THE ALLOYS.

The alloys were made from pure aluminium supplied for the purpose by Messrs. The British Aluminium Company of London, and found to contain on analysis the following impurities:

Iron	0.16
Silicon	0.21

The zinc used was specially pure; it was obtained from

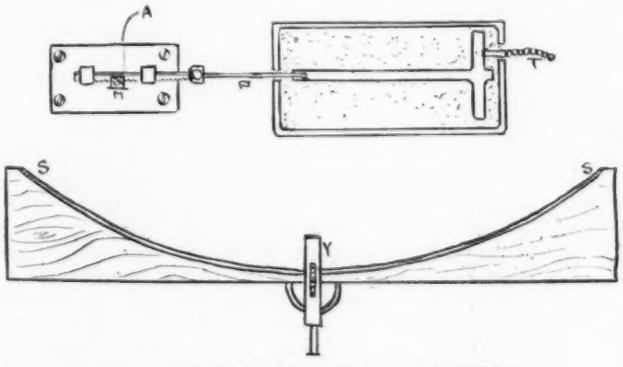


FIG. 2. PLAN OF MIRROR EXTENSOMETER.

Messrs. Brunner, Mond & Co., of Northwich. According to analysis by Mr. Murray it contained:

Iron	0.01
Lead	0.006
Cadmium	0.05

with traces of arsenic and antimony.

*Paper read at Glasgow meeting Institute of Metals, September, 1910.

Since both Shepherd (10) and Bancroft (12) lay great stress on the fact that aluminium readily absorbs silicon when melted in a fireclay crucible, some of the pure aluminum was melted in a salamander crucible, and heated to about 800° C. On testing the melt, the silicon content, which was then 0.25 per cent., showed very little increase on its original value (0.21 per cent.).

In making up the alloys, therefore, the aluminium was first melted in a salamander crucible set in a small injector furnace. The necessary amount of zinc was then added, when it was observed that in the case of the alloys containing much zinc the whole mass became solid. On further heating the substance melted, and the alloy was well stirred and poured. The melting up and alloying were effected under an atmosphere of coal gas to minimize oxidization.

APPARATUS USED.

Extensometer and cooling curve readings were taken simultaneously, as has been described in dealing with the antimony-lead alloys. The apparatus used was the same as that employed for the previous series, with the exception of the extensometer, which was an adaptation of an instrument made by Mr. Murray, and worked on the reflecting principle.

Referring to the plan (Fig. 2), the bottom box of the mould is shown made up just as for casting the antimony-lead alloys. The extensometer pin P was attached by a socket and thumb-screw to a rack which worked in two guides, and was capable of horizontal motion. This rack engaged with a pinion fitted to a vertical spindle which worked easily between adjustable centres; on this spindle just above the pinion a mirror, M, was fixed, being a silvered microscopic cover glass. The rack and pinion were very carefully made, and as the position of the spindle was adjustable, it was a simple matter to arrange the apparatus so that there was no play between the moving prts.

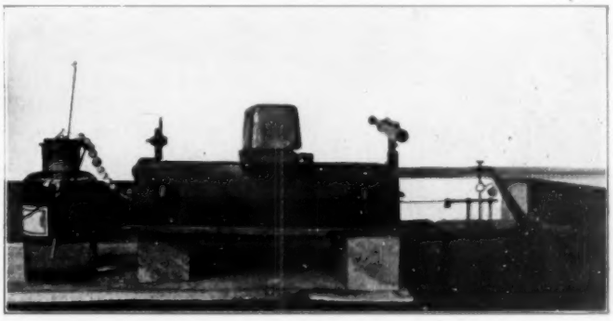


FIG. 3. MIRROR EXTENSOMETER.

Changes in length of the test bar in the mould were thus communicated to the mirror, which turned through an angle proportional to the length variation of the test. A boxwood metre scale, SS, was bent to the shape of the arc of radius equal to its distance from the mirror, and mounted on a stand; immediately above this scale was a cross-wired telescope, Y, by which the reflections of the scale in the mirror were observed, and thus values were obtained from which the shrinkage curves were plotted.

The magnification adopted was about 1:400. As compared with the older dial form, this extensometer gives

increased magnification and sensitiveness owing to the use of a larger scale, and a more accurate method of reading, it being quite easy to read rapidly to 0.5 millimetre. By this means any critical part of the curve may be established by a much greater number of points than was possible when using the dial extensometer. The question of play between the moving parts, and of possible strain in the case of very large length alterations is also eliminated in this apparatus. The photograph (Fig. 3) shows the apparatus set up ready for casting; an ingot of lead is placed on the top of the mould to insure good contact between the top and bottom boxes. The method of casting the bars was exactly the same as when working with the antimony-lead alloys. As it appeared possible that the expansion of the pin connecting the test bar with the extensometer might introduce an ap-

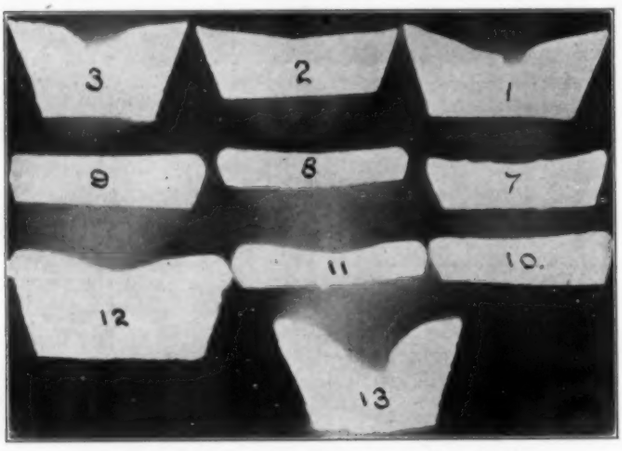


FIG. 4. PIPING OF ALUMINUM ZINC ALLOY.

preciable error, a check casting was made of one of the bars, but a thin glass rod was employed in place of the iron wire ordinarily used as a pin. Within the range of experimental error the results in each case were identical. The use of "invar," which had been originally contemplated, was therefore abandoned.

ASSAY OF THE BARS.

The assay of aluminium-zinc alloys described by Seligman and Willot ([11]), comprising solution of the sample in a strong solution of caustic soda, followed by precipitation of the zinc with sulphuretted hydrogen, redissolving the zinc sulphide in hydrochloric acid, and titrating, gave good results for alloys containing high percentages of aluminium. But for alloys containing much zinc this method was impracticable, as the samples were only partly soluble in the caustic soda solution. High zinc alloys were simply dissolved in hydrochloric acid and titrated with potassium ferrocyanide without any previous separation. Bars containing less than 75 per cent. aluminium were assayed by this direct process. The method was calibrated by introducing varying amounts of aluminium into the solution when standardizing the potassium ferrocyanide solution, and a curve was drawn expressing the effect of aluminium on the assay results. By this means a rapid and accurate method of analysis was obtained. Bars containing upwards of 75 per cent. of aluminium were subjected to precipitation with sulphuretted hydrogen, as described by Seligman and Willot, before titrating. The aluminium was obtained by difference in every case.

DESCRIPTION OF THE BARS.

All the alloys gave good castings, but those containing 50 to 60 per cent. aluminium gave the cleanest and sharpest castings of the series.

It was thought that the amount of piping in the gates of the cast bars might be of some value in subsequently considering the expansion curves, and the character of the gate of each bar was noted. As will be seen from the photograph (Fig. 4), the greatest amount of piping is shown by Bar I. (pure zinc), Bar III. (4.31 per cent. aluminium, the eutectic alloy), and Bar XIII. (pure aluminium). With the antimony-lead alloys it was noticed that the nearer the casting temperature was to the beginning of solidification, the greater was the piping. This is not true of the present series of alloys, for Bars VII., VIII., IX., and X., all of which were poured at a very low temperature, exhibit little or no piping in their gates. Bars IV., V., and VI. show no piping at all.

Arguing from these results, it would appear that substances which solidify at a more or less constant temperature (such as pure metals and eutectics), and those which expand on solidification, show the greatest tendency to pipe, although the amount of piping is governed also by the casting temperature. The numerical results obtained in this part of the research are included in Table II.

TABLE II.

Bar.	Aluminum.	Zinc.	Expansion (in inches) on 12 inches.	Hardness.	Remarks.
	Per Cent.	Per Cent.			
I....	....	100.0	.00126	14.0	Much piped.
II....	2.44	97.56	.00058	22.0	Slightly piped.
III....	4.31	95.69	.00063	24.5	Eutectic alloy; much piped.
IV....	9.48	90.52	.00029	28.0	Not piped.
V....	21.03	78.97	.00048	42.9	" "
VI....	30.55	69.45	.00084	38.5	Not piped; clean casting. Drilled much softer than V.
VII....	39.54	60.46	.00116	43.3	Not piped; seemed harder than V. when drilling.
VIII....	49.84	50.16	.00126	51.8	Not piped; excellent casting.
IX....	60.21	39.76	.00048	41.2	Not piped; very sharp casting.
X....	68.54	31.46	.00056	35.0	Not piped; much softer than Bars VII. and VIII. when drilling.
XI....	79.28	20.72	.00066	25.8	Slightly piped.
XII....	89.33	10.67	.00058	7.8	Distinctly piped.
XIII....	100.0	....	.00106	2.8	Much piped.

As was the case with the antimony-lead alloys, the highest temperature recorded by the thermo-couple placed in the mould (the "casting temperature") was in many cases below that of the commencement of solidification, as deduced from Shepherd's diagram.

This is unfortunate, as it detracts from the value of the cooling curves, but it was unavoidable on account of the rapidity of cooling, and the necessity of pouring at a low temperature in order to obtain reliable readings for the shrinkage curves, which are of primary importance. There is reason to believe that in some cases distinct surfusion occurred, and possibly also the "lag" of the pyrometer prevented its reaching the maximum temperature of the cast. It has, however, been thought best to present the curves in their entirety. All the alloys were perfectly fluid when cast.

SHRINKAGE OF THE ALUMINIUM-ZINC ALLOYS.

Shepherd ([10]) and Bancroft ([12]) attribute the superior casting properties of these alloys to the increase of fluidity and decrease of surface tension obtained on alloying, and express their doubts as to the influence of possible expansion on solidification in this respect.

That fluidity and low surface tension are of impor-

tance in determining the good casting properties of these alloys is shown by the nature of the tops of the gates which have perfectly rounded edges for all alloys containing from 50 to 90 per cent. aluminium. But while these factors undoubtedly affect the casting properties of any material, it may be argued fairly in this case that the excellent castings obtained were due in part to expansion on freezing, the best castings being obtained with alloys containing from 40 to 60 per cent. aluminium, a range of composition which includes the maximum expansion of the series.

The shrinkage curves obtained with the pure metals confirm Murray's results, both aluminium and zinc bars showing considerable expansion on solidification.

The curve of maximum expansion for each alloy (see Fig. 1) shows that the expansion on solidification drops from that of pure zinc to a minimum at 2.4 per cent. aluminium, exhibits a small maximum at the eutectic composition (4.31 per cent. aluminium), and then rises uniformly to a second much larger maximum at about 50 per cent. aluminium, after which it undergoes a sudden fall, and finally rises, slowly at first and then more rapidly, to the large expansion shown by pure aluminium.

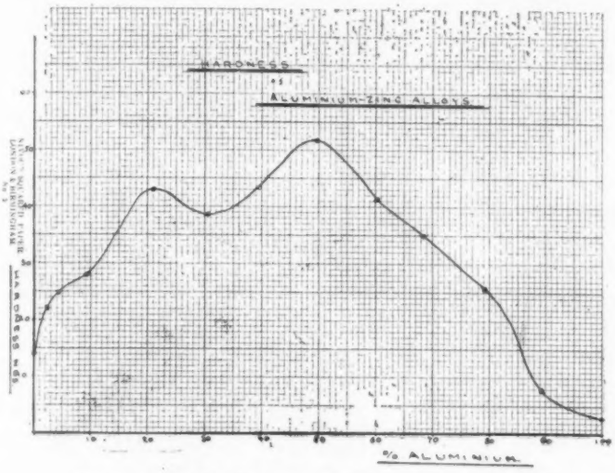


FIG. 5. HARDNESS OF ALUMINUM-ZINC ALLOYS.

This curve exhibits some interesting points when compared with the equilibrium diagram, and has therefore been added to the latter (Fig. 1). The maximum shown at the eutectic point is worthy of notice, when it is remembered that a similar maximum was obtained at the eutectic composition of the antimony-lead alloys. But if one disregards this maximum for the moment as being a characteristic property of eutectics, which, indeed, seems a fairly justifiable supposition, the expansion curve might be continued underneath the eutectic maximum, as shown on the equilibrium diagram, and would then follow the shape of the liquidus very closely from nearly pure zinc up to about 50 per cent. aluminium.

The expansions of the alloys within these limits (2 to 45 per cent. aluminium) are therefore proportional to the distance of the solidus from the liquidus (since the solidus over this range is the horizontal eutectic line), and may be said to support Murray's suggestion, that expansion is proportional to range of temperature during solidification. With the disappearance of the eutectic, on exceeding 50 per cent. aluminium, the expansion suddenly falls, and the alloys, now consisting of a simple solid solution of zinc in aluminium of varying degrees of concentration, show a more or less uniform expansion until, with more than 90 per cent. aluminium, the larger expansion of this metal begins to make its influence felt, and the curve rises sharply.

HARDNESS.

Following the same method of procedure as in dealing with the antimony-lead alloys, the hardness of the aluminium-zinc test bars was investigated, again using the scleroscope.

The curve obtained was very much what might be expected (see Fig. 5); the only outstanding feature is a small minimum at about 30 per cent. aluminium. This was confirmed on machining two sides of the test pieces perfectly parallel and again testing their hardness.

The hardness increases rapidly from pure zinc up to the eutectic composition, and then more slowly up to a small maximum at about 20* per cent. aluminium, whence it falls to a minimum at 30 per cent., and rises again to 50 per cent. aluminium, the hardest alloy of the series. This point corresponds with the solid solution of zinc in aluminium containing the largest possible amount of zinc compatible with a homogeneous structure. After passing this point the hardness falls uniformly to pure aluminium. A rough gauge of the hardness of the bars was obtained when drilling out the samples for analysis

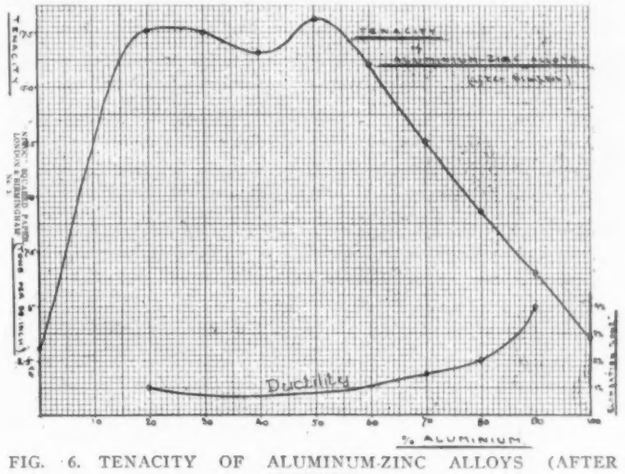


FIG. 6. TENACITY OF ALUMINUM-ZINC ALLOYS (AFTER SIMPSON).

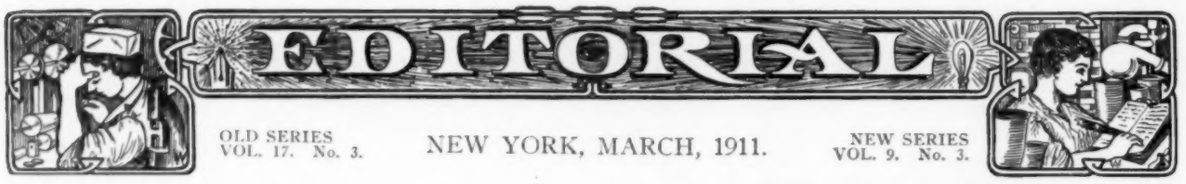
before the hardness tests were made, and it confirmed the general shape of the curve and the minimum at 30 per cent. aluminium subsequently found by scleroscope tests.

The bars were all fractured in a vise by tapping with a hammer. The influence of small amounts of aluminium on zinc was very noticeable. Bar I. (pure zinc) showed the usual coarsely crystalline structure. Bar II., containing 2.4 per cent. aluminium, had a fine grained fracture, and stood a great deal more hammering than Bar I. before it broke. The eutectic alloy (4.31 per cent. aluminium) showed a fracture much coarser than that of Bar II., while Bar V. (21 per cent.) showed a very fine fracture, somewhat resembling that of tool steel, and was very difficult indeed to break. Most of the bars snapped without appreciably bending, a small amount of ductility being observed only when the eutectic limit of 50 per cent. aluminium had been well passed.

WORLD'S PRODUCTION OF LEAD IN 1909.

The world's production of lead in 1909 aggregated 1,052,500 tons, of which the United States produced 339,700 tons and consumed 365,200 tons.

*It may be observed that the arrest at 250° C., which will be referred to later, shows its maximum effect at about this composition.



OLD SERIES VOL. 17. No. 3. NEW YORK, MARCH, 1911. NEW SERIES VOL. 9. No. 3.

THE METAL INDUSTRY

With Which are Incorporated
THE ALUMINUM WORLD
THE BRASS FOUNDER AND FINISHER
THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS

Published Monthly by
THE METAL INDUSTRY PUBLISHING COMPANY (Incorporated)

PALMER H. LANGDON - - - - - - - President and Treasurer
FREDERICK F. BURGIN - - - - - - - - - Vice-President
JOHN B. WOODWARD - - - - - - - - - - Secretary

Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE, $1.00 PER YEAR, POSTPAID TO ANY PART OF THE WORLD. :: SINGLE COPIES, 10 CENTS

ADVERTISING RATES ON APPLICATION

PALMER H. LANGDON - - - - - - - - Editor and Publisher
LOUIS J. KROM - - - - - - - - - - Managing Editor
GEORGE W. COOPER - - - - - - - - - Advertising Manager
THOMAS A. TRUMBOUR - - - - - - - - - - Cashier

ADDRESS ALL CORRESPONDENCE TO
THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK
TELEPHONE NUMBER, JOHN 689 CABLE ADDRESS, METALUSTRY

CONTENTS

METAL PRICE CONTROL

The agitation resulting from rumors of mergers in copper seems to have somewhat subsided, due, no doubt, to the reports of restricted production. With the publication of each month's figures of copper production evidences of such restriction are looked for, but nothing material happens, and though the wise men of the East nod their heads sagely and say "Just wait"! The public waits and consumers stay out of the market, except for immediate needs. The metal reports in the papers say "market quiet, but steady," and every one waits for "next month." Every once in a while some producer gets tired of waiting and a large amount of copper changes hands, but at a concession in the asking price. With copper between 12 and 13 cents per pound there should be no uneasiness on any one's part; the brass business is in a healthy condition, and copper can be profitably produced at these prices.

With tin the situation is not so restful. The metal continues to do some spectacular stunts, and takes a jump to 46 cents, with an unsettled market, and then a fall of 3 or 4 cents surprises those most interested and starts the guessing contest. As the metal is controlled on the other side of the pond, no tin being produced in the United States, we must take our medicine and be satisfied to be able to so adjust our business as to keep it on a level keel for the year. It is evident that those in control of tin can set the price figure where they please, and the law of supply and demand does not enter into the game. Tin we must have, and business conditions will adjust themselves accordingly.

Antimony is the latest metal to get into the syndicate class, and from abroad comes the report that a syndicate has been formed, consisting of two groups, one composed of the European smelters, and the other of the Chinese producers. The successful consummation of this arrangement, talked of for a long while, has led to a sharp rise in the price of the metal. A few days ago it was selling at 7c. per lb. It is said to be the syndicate's intention to make it sell at least 9c. The local market is quoted now at about 8½c.

The chief use of antimony is in the making of type metals and anti-friction metals. There is little or none produced in the United States, except in conjunction with pig iron. The latest statistics show a production of 14,000 to 16,000 tons of antimonial lead per annum, containing about 10 to 12% of antimony. American imports of the metal are about 4,000 tons per annum. China is the chief producer of antimony ore.

Platinum is another metal that is commanding a great deal of attention. It is reported that the Russian Gov-

ernment has decided to establish a refinery for platinum produced in Russia; after it is complete the export of crude platinum will be prohibited. This will undoubtedly strike a blow at the platinum refining concerns in this country. At the present time there is a scarcity of the metal, owing to the increasing demand for use in jewelry, electrical and automobile manufacture. It is estimated that the demand last year exceeded the supply of 30,000 ounces. The price has steadily risen and all indications are that there will be further increases.

SPELTER.—This metal is produced in this country in sufficient amount to supply the demands of consumption, very little being imported; in fact, Germany imported some 8,000 metric tons of zinc ore from the United States in 1910. The price of spelter has advanced slightly with every prospect of further increases. The metal is really in the hands of two large interests, divided between the Western and Eastern branches, and the situation is such that spelter manufacture is not an attractive proposition to the small producer. As spelter is one of the principal ingredients in the manufacture of brass and also large amounts are used in galvanizing processes, the demand for the metal holds very steady, and even slight advances in price cause great uneasiness. What has been said about spelter is practically true of lead, and a rise rather than a fall can be looked for in the near future.

Taking the metal price situation as a whole, there seems to be a rising tendency in sight. A general atmosphere of alertness is apparent and the slightest indication of an increased demand is a signal all along the line for prices to go up. Consumers, however, seem to be able to judge correctly the situation and do not rise as readily to bait held out as expected, and after a short period of waiting, prices fall off. In conclusion we look for higher prices for the metals most in everyday use and we hope to see business conditions continue to improve as they have for the past month.

HIGH PRICES OF CHEMICALS

The market for amyl acetate and refined French oil is in a state of great unrest. The large manufacturers in this country are really not quoting on the materials. The real cause of the high price, which has steadily advanced during the past month from $1.80 to $2.00 per gallon, is not at once apparent. The producers of amyl acetate and fusel oil in England report a shortage of raw material, and consequently, with increased consumption of the refined products, a higher price can readily be obtained. Whether this is correct or not we do not know, but we do know that the present prices are higher than ever before, and that continued high prices for these two materials will not fail to have a disastrous effect on the lacquer manufacturing business.

Lacquer, as is probably well known, is made by dissolving various gums and gun cotton in either fusel oil, amyl acetate or both, and these lacquers play a very important part in the brass business. The high price of lacquer, then, will cause considerable trouble in the manufacture of brass products, especially among the small manufacturers. Does it not seem as though the time had come for the industrial chemist to "get busy" and give us a cheap and abundant substitute for fusel oil and amyl acetate?

THE CORROSION OF METALS

The employment of metals in place of iron was in the past adopted in many instances for the express purpose of lessening the trouble due to corrosion, for it was long ago recognized that these metals were less corrodible than any form of iron and steel. Past experience clearly shows that all the forms in which iron and steel come into the market are peculiarly liable to corrosion, and the classical researches into its causes, which have been carried out in America by Cushman, Gardner, Walker and Whitney point clearly to the fact that only palliative and not prohibitive measures are likely to be available in the near future. But it was soon found that even non-ferrous metals are susceptible to the insidious disease, and indeed, at the present moment, we are in the midst of a period of singular activity on the part of corrosion, which renders it peculiarly fitting that a determined and organized attack should be made to resist its onslaughts.

In the early days of the use of copper little trouble was met with from corrosion. It is frequently stated that trouble has only arisen in the last few years, but this is not altogether correct, for we find that in 1823 Robert Mushet took out a patent for the manufacture of a corrosion-resisting alloy suitable for sheathing which consisted of copper containing one-eighth per cent. of tin or zinc, while in the following year Sir Humphrey Davy carried out a series of experiments on the best means of protecting the copper-sheathing of ships from the corrosive action of the sea water. The records of the American Society of Naval Engineers show that serious and frequent trouble has been met with in the case of copper sheathing on vessels, while since 1900, the trouble has broken out with a still greater degree of virulence.

As a preliminary to the mitigation of this important trouble which has baffled metallurgists for many years, and has caused endless vexation, annoyance and expense, it is necessary to have in a sufficiently convenient and comprehensive form, a record of the researches of past workers. To undertake this task and to draw from the investigations sound and workable conclusions would be too much for the power of one individual, and requires the financial assistance and co-operation of some organized body. Happily there is such a body which has not shirked the stupendous task which the work involves, and the Institute of Metals, which has undertaken an inquiry into the corrosion of metals, are to be commended for the enterprise they have shown so early in their career. For the carrying out of this inquiry the institute have appointed a Corrosion Committee.

This development is of great practical interest and importance, inasmuch as it will probably result in the elucidation of some of the causes of breakdowns in boiler and condenser tubes, propeller blades and other metallic bodies. Articles of this description sometimes corrode in a most unaccountable fashion. For example, a couple of condenser tubes may be produced and used under identical conditions, yet one will corrode rapidly and the other remains perfectly sound.

The first thing that strikes one when contemplating the work which the Corrosion Committee of the Institute of Metals have set themselves is the very wide extent of the field to be explored. The inquiry will probably take many years to complete, although practical results may be looked for before its termination. The committee have already presented a report on the subject, but this was merely a preliminary one dealing simply with the present state of our knowledge in regard to the matter, and throwing out some suggestions for research into the causes of the corrosion of brass condenser tubes in sea water. Mr. G. W. Bengough is the author of this preliminary report, and he has compiled an interesting summary of the chief researches published on the corrosion of brass and the hypothesis that have been advanced to account for such corrosion, together with suggested methods of prevention. In view of the value to metallurgy and engineering of the investigations undertaken under the aegis of the Corrosion Committee, it will repay a further study of the lucid report which Mr. Bengough has presented.

The brass chosen for special study was the 70:30. This alloy comes into commerce in the form of such important products as condenser tubes for marine and stationary engines, and of cartridge cases. It has generally been considered to be a stable, homogenous, solid solution, though some considerable doubt has been thrown upon this view by recent work. Probably it is not a chemically stable body, even at the ordinary temperature, and at the higher temperatures at which it is used in condensers, any change which it may undergo will proceed at an enhanced rate; in consequence, its behavior towards corrosive agents will probably be affected. In addition to this it does not, as a rule, dissolve or corrode as a whole, but exhibits the phenomenon of a preferential solution of zinc. Hence, we are dealing with an alloy where surface is of a progressively changing composition, and the question immediately arises, "In what manner does this action take place, and what is the state of aggregation of the metals in the solid alloy?"

It is not an easy matter to deduce a definite answer from a study of the published records of investigations on the subject because of the contradictory results arrived at by different experimenters. Many of these attribute the corrosive action of sea water to electrolytic action, but there is an absence of unanimity in their solution of the electro-negative member of the voltaic couple. Tilden considers that deposits of basic chloride will enhance corrosion, and he recommends that precautions should be taken to prevent its accumulation. Sexton, on the other hand, considers that this material is, if anything, slightly protective, while another experimenter states that CuO is an excellent protector owing to its insolubility in sea water—a view which will probably meet with general accord. According to the electrolytic theory, however, the corrosion of ordinary metals is due to a lack of chemical and physical homogeneity, and the action of a solution containing ions of a less electro-positive character than the metal or alloy in question. Corrosion can be accelerated by the presence of any substance that is capable of removing the hydrogen displaced from solution by the corroding metal, or even by any peculiar configuration of the surface of the metal itself that facilitates such removal.

The foregoing is a simple explanation of the phenomenon with which we have to deal. But what we are anxious of finding out is the method of preventing it. Here the report of the Corrosion Committee of the Institute of Metals comes to our aid with one or two interesting suggestions in connection with the performance of experiments on corrosion. Mr. Bengough recommends the division of these experiments into series—one to secure results of immediate practical interests, and the other to accumulate scientific data for the more minute study of the problem. It will be some years before these methods of experiment produce any tangible result; but the Institute is approaching the matter in a systematic and scientific manner, so that there is reasonable hope for practical results. Mr. Bengough, the author of the report, recommends that a set of forty-eight condenser tubes, 3 ft. long, might be subjected to the action of sea water, the effect of the artificial obstructions of ashes, shells, seaweed, etc., on corrosion being also examined, together with the effect of deposits of ferric oxide and basic chloride. The acceleration of corrosion by an increase of temperature, the use of acids with and without a current of air bubbles, and the employment of a small electromotive force might also be determined with smaller portions of the same tubes. The second series of experiments might deal with the effect of electrode potential on copper and brass, pure and with definite quantities of impurities, in order to ascertain the influence on solution pressure and depolarization. These suggestions, if adopted, should lead to results of considerable value on a matter of great importance to engineers and metallurgists. Results which, if intelligently interpreted in practice, would aid materially in solving some of the problems that have long baffled the most expert in the metal industries.

NEW BOOKS

"ARTS CRAFTS LAMPS—HOW TO MAKE THEM." By John D. Adams. Size 5 x 7 inches; 87 pages; bound in cloth; numerous illustrations. Published by Popular Mechanics Company. Price 25 cents. For sale by The Metal Industry.

This is an interesting book belonging to the series of hand books on industrial subjects which are now being published by the above company. The subject matter of this book is taken up with directions for the production of the rapidly becoming popular arts crafts lamps, for which sixteen designs are described, illustrated and worked.

NICKEL PLATING

To the Editor of The Metal Industry:

I read "Electro's" comments published in the February number of The Metal Industry, and I am interested in the new discoveries he has made in electro-chemistry. He can start out with a solution of nickel ammonium sulphate and deposit nickel, completely regenerate his solution from the anode, decompose the ammonium sulphate into free ammonia gas, and then again decompose this into hydrogen and nitrogen, verily a most remarkable and valuable discovery. Why not bottle up the hydrogen and pick up the nitrogen that is floating around in the solution and make them commercial articles, why not obtain capital and promote this new method of obtaining hydrogen and nitrogen as a by-product of nickel plating?

Unless some market is found for these by-products "Electro" will not long be a plater, if he is one, because anyone who loses the efficiency of current, such as must be lost in this case cannot do commercial nickel plating. I can see one big objection to the pretty theory so well worked up, and that is the following: When free ammonium gas is liberated at the cathode it immediately combines with water to make ammonium hydrate as per the following equation—$NH_3 + H_2O = NH_4OH$. Everyone is familiar with this equation and knows that water absorbs ammonia gas immediately. Now instead of having hydrogen and nitrogen we have free ammonia at the cathode, and if I am any judge, the average plater knows what the effects of ammonia are in a nickel solution, even in small quantities. "Electro" generates ammonia wholesale, but his solution never becomes alkaline. This would tend to make one believe that either his test paper is in bad condition or else his theory is not a good one. Personally I am inclined to accept the latter as approaching nearer the truth. Another argument against this theory is; that whenever a plater sees hydrogen coming from his cathode he suspects that his solution is low in nickel and his deposit soon shows the ill effects of such "gassing." When in good working order there is no "gassing" at the cathode, and I would ask "Electro" to explain what becomes of all the hydrogen gas he generates under working conditions. I would also like to ask him what he thinks of a plater who gets only 50 per cent. efficiency from his nickel solution? If his solution acts as described I doubt if he can get even 50 per cent. efficiency.

To return to my statement that the nickel sulphate decreases and the ammonium sulphate increases. I think that the average plater is cognizant of the fact that a solution made from nickel ammonium sulphate does need to be replenished with nickel salts as the anodes do not give 100 per cent. efficiency in most solutions, although "Electro" has found that they do in his. The plater has, I feel confident, found that sometimes he will place a hydrometer in a solution that is acting badly and find that the density is all right, and on further examination he will notice that the color of the solution is not dark enough. He immediately adds water and nickel salts to give him the proper solution, and if he is wise, he adds nickel sulphate. I can best explain the fact that "Electro's" solution remains acid by the fact that the tendency to become alkaline is not usually manifest until the solution has become so depleted of nickel salts that the ammonium sulphate is decomposed with the formation of ammonium hydrate as follows:

$$(NH_4)_2\,SO_4 = 2NH_3 + H_2SO_4$$
$$2NH_3 + 2H_2O = 2NH_4OH$$

The second equation takes place immediately in the solution. The above merely carries out the work that "Electro" started in his letter. I must take exception to other remarks made in the same letter which states that "It has never been made to give good results, and the writer is not aware of its being used today." Are we to assume that because "Electro" is not familiar with the nickel sulphate solution and does not know anyone who uses it that it is not being used? I can make affidavit that it is being used in some of the most up-to-date manufacturing concerns of the day in this country and abroad, and not only is it being used, but it has replaced the nickel ammonium sulphate solution entirely. It is also a strange fact that the largest chemical and plating supply houses sell large quantities of nickel sulphate, and we can safely assume that people do not buy unless they want the salts.

In closing I would remark that, although the nickel ammonium sulphate solution may not have been the first, it was the first that was used commercially to a large extent, and I feel safe in saying that to the use of this salt we owe a great deal of our progress in this particular art. The nickel ammonium chloride salt is not used extensively, nickel nitrate never was of use in nickel plating, and the nickel carbonate salt being insoluble in water could not be used in that form. Such arguments as "Electro" uses give an excellent opportunity to bring to the attention of the plater the results of recent experiments and research, and to show that their industry is actually making advances as well as others. For this reason I feel that my thanks are due to "Electro" for bringing out certain points that others may have thought of and not expressed. I cannot get an old expression out of my mind, an expression that seems to be particularly apropos in this case. "A little knowledge is a dangerous thing."

Percy S. Brown.

Oak Park, Illinois, February 26, 1911.

THE MANUFACTURE OF POLISHING WHEELS

To the Editor of The Metal Industry:

We have carefully read the article on polishing wheels by T. C. Eichstaedt in the February issue of your paper. Are we correct in assuming that this article is to be followed by others by the same gentleman? Some of the phrases would indicate that this was only the first article. We agree with Mr. Eichstaedt in most of the statements made, and the article will certainly be of benefit to many polishers who are using the leather covered wood wheels described. The weakness of the article from the writer's standpoint, is its brevity, together with the fact that wood wheels are rapidly going out of use. As manufacturers of every known kind of polishing wheels and the only partiality we might have being based on an experience of fifteen years with all different kinds of wheels, would say that the wood polishing wheel is the poorest wheel manufactured from a practical and mechanical standpoint, so far as use is concerned. Mr. Eichstaedt's article would have been of more value and more apropos if published fifteen or twenty years ago, when wood wheels were practically the only polishing wheels known, than today, when wood wheels are the one thing polishers as a rule are trying to get away from.

The fundamental principle of all good polishing is a wheel which is flexible, resilient, and lively in action, to readily adapt itself to the varying contours of a piece of work and run smoothly and without chatter. Wood wheels do not contain one of these elements. Mr. Eichstaedt's article seems to be based more nearly on his experience with the old style wood wheels than upon the general experience with various kinds of polishing wheels. We would take issue with Mr. Eichstaedt on his method of heading the wheels, that is, to dry the glue after they have been set up with emery. This practice weakens the glue in hastening the drying of it, and the outside film drys and feels hard to the touch, while the glue is still soft underneath, with the result that the heading has no strength and lasts only a few minutes or a

few hours. One of the weakest points is the practice of gluing wheels up late in the afternoon and putting them to work the next morning. Forty-eight hours is absolutely the minimum time limit for drying and seventy-two hours gives better strength and economy.

Mr. Eichstaedt has written that one man should be in charge of glueing and setting up of the wheels, and this will save a concern a good deal of money. A polisher should be employed to polish, and cannot be expected to be a chemist and familiar with the technicalities of handling a chemical such as glue. The article states that wheels with grooves for polishing sewing machine band wheels, screw heads, etc., did not pay. That is true in the case of the leather covered wood wheel, but as a mater of fact, it is perfectly practical and very economical to fit the face of a polishing wheel to the shape of the work where the type of the polishing wheel will permit it. We have designed hundreds of wheels for this class of work with splendid results. The beveled wheel Mr. Eichstaedt speaks of, made of wood with leather covers, is in common use in England, but has no advantage over the American style of building the wheel with the strips of pine crossed at right angles.

DIVINE BROS CO.
B. H. Divine, president.

Utica, N. Y., February 20, 1911.

[The article referred to is only one of a series by Mr. Eichstaedt, and the leather covered wooden wheel was treated first because it was the oldest in use. The later types of wheels will be treated in the following articles.—Ed.]

ACID RESISTING ALLOYS

To the Editor of THE METAL INDUSTRY:

The writer was very much interested in the article on "Physical and Chemical Tests of Some Acid Resisting Alloys," in the January issue of THE METAL INDUSTRY. As you are probably aware, we produce, or manufacture sheet lead containing antimony; this is now sold under the copyrighted name of Hoyt Metal Sheet. We note that you say in your article that the 10 per cent. antimony is considered the best of the antimony mixtures. We have found that the 6 per cent. for agitator linings where crude petroleum is used seems to be the best for this particular work. To some of the chemical companies we sell this material containing 7 per cent. antimony, and some 10 per cent. The only objection to the 10 per cent. being that lead burners, if they do not handle it properly, are liable to crack same, owing to its stiffness. This, however, can be overcome by heating the metal when it is being installed.

We were very glad to read your article, and think it reflects credit on our material. We had Ledoux & Company make some tests of this material some years ago, and the result of their experiments show that in sulphuric acid up to a temperature of 190 degs. to 200 degs., the antimonial lead stood better than the chemical sheet lead, but above that temperature the antimonial lead did not seem to stand quite as well. ADDISON L. DAY,

Mgr. Sheet Metal Dept. Hoyt Metal Company.

New York, February 27, 1911.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY ADDRESS THE METAL INDUSTRY.

ALLOYING

Q.—Kindly publish the percentage of alloys used for German silver, suitable for press work and raising.

A.—A good mixture for the above purpose would be

Copper	62
Nickel	18
Zinc	20

—K.

Q.—What is the best method of alloying pure aluminum in making aluminum griddles so as to overcome drawing and shrinkage in metal?

A.—The aluminum alloy known as Alloy No. 12, and consisting of

Aluminum	93
Copper	7

is very satisfactory, provided you secure new metal. Much of that now on the market is made from turnings and dross from the automobile foundries. Drawing and shrinkage are often due to pouring metal at too high a temperature or ramming green sand cores too hard.—J. L. J.

CASTING

Q.—We enclose a sample of tablet branze which splits after being taken from the mold. These tablets are made several feet square and are at first sight apparently all right, but as soon as a small piece is cut out the whole tablet splits as is shown in the sample. Can you give a remedy for the trouble?

A.—The casting should be gated on all four sides so that it can be poured quickly and at not too high a temperature. The trouble is due to shrinkage, the casting probably having been improperly gated. This "splitting" is often seen in copper castings.—J. L. J.

DEPOSITING

Q.—I am having difficulty in getting a heavy deposit of yellow brass on white metal, as it blisters after a light coating has been deposited. I am using an electric cleaner but no other dips. Kindly tell me how to prevent this.

A.—To prevent blistering of the brass deposit upon white metal, use the following method: After cleansing the surface of the articles in a warm cyanide of copper bath, use the following proportions:

Cyanide of potassium	6 ozs.
Carbonate of copper	3 ozs.
Bisulphite of soda	4 ozs.
Water	1 gal.

One or two minutes deposit will be sufficient. Afterwards plate in a nickel bath for ten minutes, then finish in your regular bath. You will find that this will overcome your difficulty. If the regular bath should then have a tendency to blister, reduce the density of the solution one-third, then add one ounce of bisulphite of soda to each gallon of solution.—C. H. P.

DIPPING

Q.—Kindly give me a good dip lacquer for small brass trimmings, also a brush lacquer for electric fixtures. At what degree Baume should a black nickel solution stand for good results?

A.—You can obtain this information from any of the reputable lacquer manufacturers, whose names and addresses will be found in the advertising pages. There is no money saved by compounding lacquers yourself unless you are an expert and understand the mixing for various classes of work. The specific gravity Baume for a black nickel should be from 5 to 6 degrees for good results. Too concentrated solutions produce nickel gray tones. —C. H. P.

FINISHING

Q.—Kindly advise us what kind of a solution to use to make a "metal anti-rust dip" dead black?

A.—On page 424 of the October number of THE METAL INDUSTRY you will find an article entitled "Gun Metal Finish by Ionic." This is a similar finish to the Bower Barff or anti-rust finish produced upon builders' hardware made from wrought

iron and will withstand the elements and retain its finish. If this method is too complicated or the results are not quick enough, then your only resort will be to an imitation, which can be accomplished as follows: Cleanse the articles thoroughly from greasy substances with a hot alkali in the form of potash or soda dissolved in boiling water in the proportion of one-half pound to the gallon. After the cleansing rinse in cold water and immerse in a solution of copper consisting as follows:

Sulphate of copper	1 oz.
Sulphuric acid	1 oz.
Water	1 gal.

A quick immersion should be given in this bath. The iron will then be coated with a film of copper. Rinse the articles again in cold water, then immerse in a cold solution, consisting of

Liver of sulphur	1 oz.
Water	1 gal.

The copper will become coated with a sulphide of copper. Remove and rinse in water, then dry out with the aid of boiling water and maple sawdust. The articles should be lacquered with a dead-black lacquer, which may be accomplished by dipping or spraying. This will give you a good dead-black anti-rust finish. —C. H. P.

GALVANIZING

Q.—In practice, when galvanizing, a small percentage of tin is used, and we find that the zinc dross, or hard spelter, becomes contaminated with a percentage of something like 0.4%. Can you suggest an inexpensive method to eliminate the tin from the hard spelter?

A.—It is no longer considered good practice to add tin to spelter for hot galvanizing. Aluminum is now very generally used as it precipitates the dross in the galvanizing tank, gives a thin coating on the articles galvanized and enables them to retain their original bright appearance for quite a length of time. Aluminum is much cheaper than tin and a smaller amount of it is required. You can utilize your hard spelter, no doubt, for making brass, having first, of course, removed the iron by the usual refining methods.—J. L. J.

MELTING

Q.—Will you kindly give us the following information: (1) Where can we obtain detailed particulars and plans on the construction of reverberatory furnaces for melting and refining copper? (2) Is it possible to pour the copper directly from the furnace through a launder into a water tank for making hollow ingots? (3) Is it advisable for that purpose to make the furnace bottom of magnesia bricks?

A.—(1) Plans and specifications for the construction of a copper furnace are preferably obtained from a reputable furnace engineer but valuable data may be found in Peters' "Modern Copper Smelting." For sale by THE METAL INDUSTRY. (2) If the copper is brought to tough pitch it can be poured directly from the furnace into hollow ingots for tube drawing. (3) A bottom of magnesite for a copper furnace is preferable to a sand bottom because the copper does not penetrate the magnesite bottom to any great extent and the losses due to copper silicate being formed are eliminated.—J. L. J.

MIXING

Q.—Please publish in your valuable columns the standard formula for No. 1, No. 2, No. 3, No. 4, babbitt metals, also genuine babbitt metal. We would also like to know if there is in use a process to take out zinc from solder metal and also a process to take out iron from zinc.

A.—Nos. 1, 2, 3 and 4 babbitts are usually made from 20% antimonial lead. The straight antimonial lead is sold as No. 4 babbitt. Solder dross is added to the antimonial lead to form the other three grades. No. 3 contains 10%, No. 2 24%, and No. 1 40% of solder dross.

Genuine babbitt is made by melting together 4 parts of copper, 12 parts of tin and 8 parts of antimony, then adding 12 parts more of tin and pouring into bars. Melt 2 parts of tin and add to it 1 part of the hardener, a bar at a time.

Zinc is difficult to remove from solder if much is present. It may be accomplished by repeated treatments in a sweating furnace. Iron may be removed from zinc by oxidizing it and then sweating.—J. L. J.

OXIDIZING

Q.—Will you please send me the formula for the Robinson finish, also one for arsenic oxidize for copper?

A.—We are not familiar with what you term the Robinson finish. There is what is termed the Butler finish. This is usually a silver finish produced with the same luster as a brush brass finish. If you will give us some idea what the Robinson finish looks like we may be able to assist you to produce it.

For an arsenic finish upon copper bronze or brass proceed as follows: Dissolve in each gallon of nearly boiling water

Caustic soda 98%	1 lb.
White Arsenic (powdered)	1½ to 2 lbs.

and when cold add ½ ounce of cyanide to each gallon. Use anodes of sheet iron with about the same current strength as used with a regular nickel bath. To produce a good bright black the articles must be previously polished in the regular manner. A two or three-minute deposit will be sufficient. The surface should be lacquered for protection.—C. H. P.

PLATING

Q.—Will you kindly tell me how much silver you have to put on waiter mounts to call them sterling silver mounts according to law?

A.—It would not make any difference how much silver you deposited on a base metal; it would still be a silver plate and not solid sterling silver as intended by law, and cannot be stamped sterling silver. You could stamp it (solid sterling silver plate) and would not then conflict with the law. If your competitors are stamping their plated articles "sterling silver" they are liable to a fine under the new law. Sterling silver must assay 925/1000 fine. It would not be worth while plating the mounts when the ratio must be so great in proportion to the base alloy.—C. H. P.

Q.—Will you please tell me how to make the best silver solution for brass in order to get a nice oxidized finish for medium class work?

A.—A silver solution for brass work should consist of 2½ ounces of chloride of silver and 6 ounces of cyanide to each gallon of water. Aqua ammonia should be added to each 5 gallons of solution. If the silver deposits a brownish tone add a small amount of hypo-sulphite of sodium, in the proportion of 1 ounce to 20 gallons of solution.—C. H. P.

SOLDERING

Q.—We find it necessary to solder sheet brass to electro galvanized sheet steel. We must use the blow pipe and the galvanized steel is exposed to the naked flame. We are using half and half solder and have tried various fluxes. As soon as the flux is applied there is a dark coating formed on the steel which will not permit the solder to adhere to same. We find it possible to solder to the galvanized steel with the ordinary soldering copper, but this method is impossible in this case.

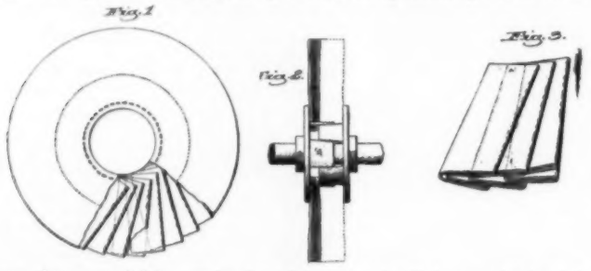
A.—This trouble you experience in soldering sheet brass to galvanized sheet steel by the aid of the blow pipe is due to the oxidization of the zinc, resulting from a greater heat upon the metal when using the blow pipe than with the copper. The regular chloride of zinc flux burns away too rapidly. Galvanized iron workers use nothing more than clear hydrochloric acid as a flux, this forms a chloride of zinc resulting from the combination of acid and zinc upon the steel. But better still for your purpose would be a mixture of equal parts of glycerine and hydrochloric acid or a mixture of two parts of glycerine and one part of the acid. The sample we sent you was soldered with the blow pipe, using the equal part mixture. But we believe better results will be obtained with a mixture containing as little free acid as possible.—C. H. P.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

981,841. January 17, 1911. Buffing or Polishing Wheel. J. C. Codman, Detroit, Mich., and F. W. Worch, Mattapan, Mass., assignors to F. L. Codman and J. C. Codman, of South Boston, Mass.

This invention has for its object the production of a novel and efficient buffing or polishing wheel made of suitable flexible material, such as cotton drilling, canvas or the like, so constructed and arranged that waste in the manufacture of the wheel is reduced to a practical negligible quantity, the greatest possible wear



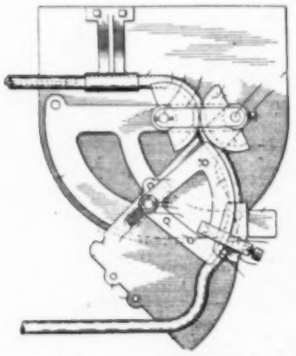
from the material is attained and increased efficiency obtained in its operation.

In the construction of the improved buffing or polishing wheel, shown in cut, an open wheel or annulus is built up by means of a circularly arranged series of members or elements each made from a quadrilateral blank of the desired material folded to present primary and final folds at right angles to each other, with oppositely turned secondary or intermediate folds.

983,931. February 4, 1911. Detinning and Degalvanizing Scrap. Alex S. Ramage, Newark, N. J., assignor to J. H. Maugham, trustee for A. S. Ramage, E. M. Davis, and the firm of Maugham and Lee.

This patent covers the following: The cyclic method of treating waste lead products, tin scrap and galvanized scrap by first dissolving the lead product in caustic soda, then precipitating the spongy lead by means of tin scrap, thus detinning the scrap and forming stannate of soda, then treating that solution with galvanized scrap, thus dezincing the scrap and forming zincate of soda, then partially electrolyzing the zincate of soda, thereby obtaining metallic zinc and a resulting liquor containing zincate of soda and an excess of caustic soda, which is again employed for treating the lead product.

983,664. February 7, 1911. Tube-Bending Machine. J. C. Wilson, Kenosha, Wisconsin, assignor to the Simmons Manufacturing Company, Kenosha, Wis.



The machine shown in cut is intended for bending tubes or pipes such as are used in metallic furniture, for example, bedsteads. At present it is fashionable to provide the tubes forming the main parts of the head and foot of a bedstead with one or more humps or curves, and to this end the improved device in its most desirable embodiment has a plurality of rotary forms about which different portions of the tube are successively bent to provide the camel-back features referred to above.

983,727. February 7, 1911. Electrochemical Process for Cleaning and Polishing Silver Plate. A. M. Kohler, Brixton, London, England.

This invention relates to a process whereby silver plate and the like may be cleaned and polished by immersing the article under treatment in an alkaline solution in the presence of aluminum or any alloy containing it in any proportion.

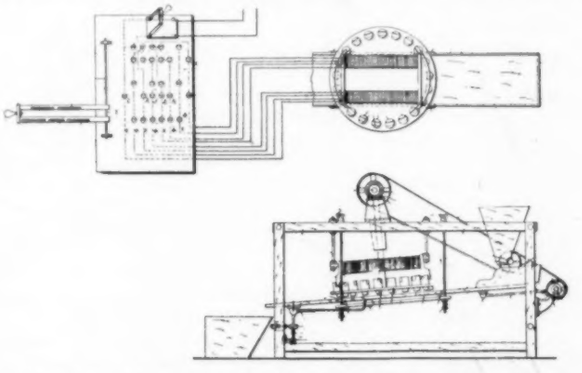
According to the present invention this cleaning and polishing solution may be made by dissolving any alkali or mixture of alkalis in water, and any suitable salt, powder or dye in any form may be added to the solution to give it color or increase its chemical action. The solution may be used hot or cold at any suitable temperature, and it may be contained in a vessel of any suitable shape, made of silver, china silver plate or any suitable material. The aluminum or the alloy containing it may be partly or fully immersed in the solution and it may be in any suitable form of shape and in any quantity.

An example of an alloy to be used in place of aluminum is as follows:

Aluminum	80 parts.
Barium	10 parts.
Calcium	8 parts.
Sodium	1 part.
Silicum and other impurities	1 part.
	100 parts.

983,881. February 14, 1911. Magnetic Separator. Alvin and Myron Dings, Milwaukee, Wis., assignors to Dings Electro-Magnetic Separator Company, Milwaukee, Wis.

The objects of this invention, shown in cut, are: First, to provide means whereby a series of movable auxiliary magnets may be energized successively from a stationary magnet by induction, and in which the auxiliary magnets will not only be deënergized, but their polarity reversed in passing from one magnetic field to another, thus removing all residual magnetism;



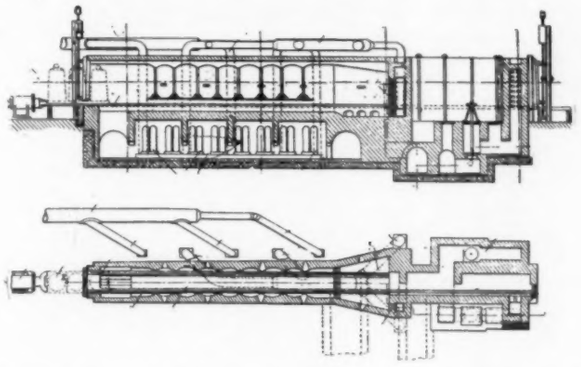
second, to provide means whereby pieces of magnetite of irregular shape and size may be removed from a slide by means of magnets traveling over the surface of such slide and such removal accomplished without clogging the machinery, or injuring the slide or magnets; third, to provide means for increasing the intensity of the magnetic field through an auxiliary magnet, located on the other side of the slide from that of the magnets which carry the material; fourth, to provide means for effectively distributing the magnetite on the surface of the slide underneath the magnetic carriers; fifth, to provide means whereby the intensity of the magnetic field may be varied by changing the path of the current in the magnetic windings.

983,981. February 14, 1911. Apparatus for Annealing. F. H. Daniels, Worcester, Mass.

The apparatus shown in cut relates to the annealing of various materials in pots, and more particularly relates to annealing rods or wire in such annealing pots. The object of the invention is to provide a pot annealing furnace of improved construction,

having novel means for heating and cooling the pots and for heating the gases burned in the furnace in the annealing operations.

The annealing pots, which contain the materials which are to be annealed, are introduced into the heating chamber of the furnace, and are caused to gradually move through the furnace, passing successively through the heating chamber into the combustion chamber forming part of the furnace and through the combustion chamber into and through the gas heating chamber



also forming part of the improved apparatus. In this way the pots and their contents are heated during their passage through the heating and combustion chambers, become cooled gradually while passing through the gas heating chamber, and at the same time the incoming, unburned gases become highly heated by contact with the heated pots in the gas heating chamber, and, when entering the combustion chamber, are in a proper condition for mixing with the air therein, in order to promote combustion and burn, the burned gases highly heating the pot heating chamber of the furnace while passing through.

984,011. February 14, 1911. Process of Etching by Electrolysis on Relief or Intaglio. A. D. Lapointe, Sioux City, Ia., assignor to Bastian and Lapointe, of Sioux City, Ia.

The patent covers the process of etching on metals, comprising the placing prints of zinc, copper or brass in a solution of water containing a nitrate salt of the metal used, then connecting the prints with the positive pole of an electric current and attaching an electrode to the negative pole in the solution.

The solution used consists of water with 12 per cent. of nitric acid added to acidulate the water. As much pure nitric acid and zinc (for zinc plates and copper for brass and copper), is then dissolved in the solution as is necessary to make the solution weigh 35 per cent. metal weight, "Baume test."

984,137. February 14, 1911. Process of Hardening Copper. R. A. Hamilton and Joshua Henry, Connellsville, Pa.

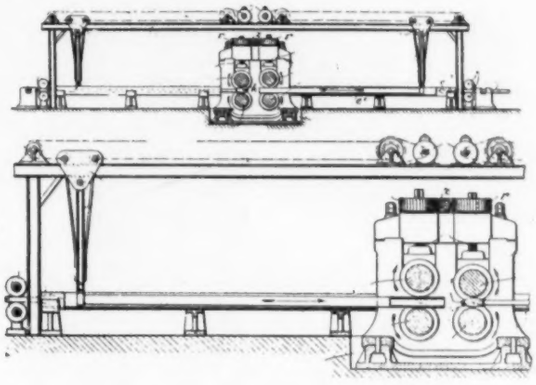
The first step in the process is to heat metallic aluminum in a crucible to a high temperature and while in this highly heated condition, there is added to the same a sufficient amount of iron pyrites to form a compound that will break brittle under the hammer when cool. The aluminum and pyrites are thoroughly stirred and mixed while in the highly heated condition until completely combined, after which the compound thus produced is poured from the crucible into convenient forms for subsequent handling.

To harden metallic copper, according to the invention, the compound referred to above is combined therewith in the following manner: First, the copper is heated to a molten condition in a crucible, after which from one to three ounces of the said compound is added to each pound of copper, according to the hardness of the copper desired, it being understood that the greater the amount of said compound added, the harder the copper becomes. Under all conditions, however, the copper is the predominent metal and is greatly in excess of the said compound. Second: in addition to said compound, there is added borax and charcoal, one-half ounce each. Third: after the introduction of the said compound, borax and charcoal, according to the proportion indicated, the heat is continued until the constituents of the molten mass become thoroughly combined, after which the resultant substance is poured from the crucible into molds or shapes desired.

984,569. February 21, 1911. Rolling Mill for Metal Tubes. Max Koch, Ratingen, Germany.

The rolling mill shown in cut is designed for rolling out metal tubes. The inventor claims:

1. A rolling mill comprising two sets of respectively vertically alined coöperating rolls, means for rotating said roll sets in opposite directions, means for alternately lowering and raising the top rolls of said sets, a pair of axially alined mandrels coöperating with the rolls, and heads loosely mounted upon the mandrels.

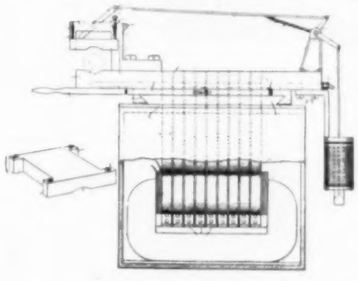


2. A rolling mill comprising two sets of respectively vertically alined coöperating rolls, means for rotating said roll sets in opposite directions, means for alternately lowering and raising the top rolls of said sets, a pair of axially alined mandrels cooperating with the rolls, heads loosely mounted upon the mandrels, and means for axially displacing the mandrels.

984,603. February 21, 1911. Electric Welding-Machine. L. M. Pryor and J. L. Trapp, Frankfort, Ind.

The machine shown in cut is a welding machine in which the heating of the metal parts to be welded is effected by electricity.

In operating the machine, a movable clamp is first thrown outwardly away from a fixed clamp, and the two parts to be welded are then placed on the fixed jaws of the clamps, and while supported in this manner, the solenoids are connected in circuit. As a result, the movable jaws are clamped to the work and after the primary winding is connected in circuit, the operator moves the operating lever in a direction to shift the slidable clamp toward the movable clamp. This brings the two pieces to be welded into engagement with each other so that the secondary circuit will be completed. Current now flows through the group of leads and bar of the movable clamp, the piece to be welded supported thereby, through the piece in the fixed clamp, another group of leads and copper bars. As the meeting ends of the pieces fuse to the desired heat, the operator increases the pressure applied to the lever so that the molecules of the molten metal will thoroughly intermingle and weld together.



984,469. February 14, 1911. Process for Making Molds for Metal Castings. Geo. H. Brabrook, Taunton, Mass.

This invention has for its object the production of a mold for the manufacture of castings, and particularly, for the manufacture of castings of a delicate nature and having fine lines and ornamentations upon their surfaces.

The patent covers the process of making a mold for metal castings, consisting of forming the body of the mold of asbestos, shaping it while moist on the pattern of the article to be cast, and providing the inner face of the asbestos mold thus formed with an inner facing of finely powdered non-fusible material.

INDUSTRIAL

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

GRAPHIC RECORDING METER

During the past two years much attention has been given to the study of machine load factors of electrically driven plants with a view of increasing the efficiency by raising the load factor on each machine. Exhaustive investigation has proven that many electrically driven factories operate at so low an efficiency that often an indifferent amount of care in the selection and operation of motors will secure economies which will pay substantial dividends.

It is highly important that the load factor of each machine be maintained at high value by keeping it working as continuously as possible and at its full rated capacity. Low machine load factors are items of great expense and in many installations run as low as 20 per cent. or less. It is possible to secure load factors as high as 80 to 85 per cent. by so arranging the work that machines are kept in continuous operation and to secure the necessary data as to operating conditions the Graphic recording meter will be found of

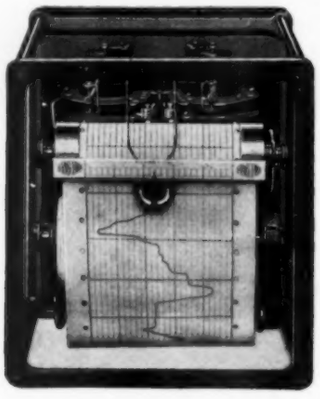


FIG. 1.—SANGAMO GRAPHIC RECORDING METER.

great value. With this device a record is made on a chart showing the exact performance of the machines, number of hours they are in operation and the exact knowledge obtained of conditions will enable the operator to so arrange the work that the greatest possibilities of the operators and machines can be obtained.

SECURING DATA.

In order to intelligently attack the problem the first step is to secure accurate data as to the power required to operate electrically driven machines for an appreciable length of time, or during a complete cycle of work. Attempts have frequently been made to secure this data by means of ordinary indicating instruments or integrating watt hour meters. The first method involves taking readings of ammeters, voltmeters or wattmeters at frequent intervals and plotting the records in the form of a curve. The second method merely gives the total energy consumption, but does not give any idea of the load variations, or time at which they occurred.

The net result of both methods is an incomplete amount of data, not only inherently incorrect, but also quite variable due to the personal equation of the observer. A demand therefore exists for a portable form of graphic recording meter by the use of which complete, constant and accurate records can be obtained from which a complete knowledge of the load factor on each machine can be secured. With a full understanding of the conditions to be met, Messrs. R. C. Lamphier, of the Sangamo Electric Company, Springfield, Ill., and H. W. Young, of Chicago, have developed a radically new type of portable meter, shown in Figs. 1 and 2, which is so constructed as to withstand the treatment to which all portable meters are inevitably subjected.

CONSTRUCTION.

The measuring elements consist of two mercury-floated motor elements so located as to actuate a common indicator to which is attached a record pen which traces a line or curve on the moving chart. The measuring elements may be separately energized as in polyphase watt-meters three wire direct current or alternating single phase; or may be connected in series or parallel for use on two-wire direct current or single phase alternating. The moving element is a simple metal disk or sector rigidly attached to a shaft carrying the recording pen mounting and control springs. The

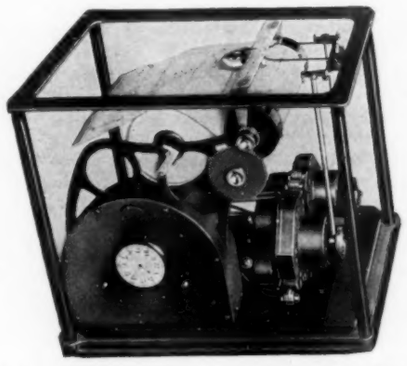


FIG. 2.—SHOWING THE INTERIOR CONSTRUCTION OF THE SANGAMO RECORDING METER.

disk is floated in a mercury chamber which not only serves as a conducting medium for the current to be measured, but also by the damping action of the disk passing through the mercury renders the meter indications highly dead beat. This is a very important and desirable feature when meters are measuring fluctuating loads as it insures a true record, free from false indications or "overshooting."

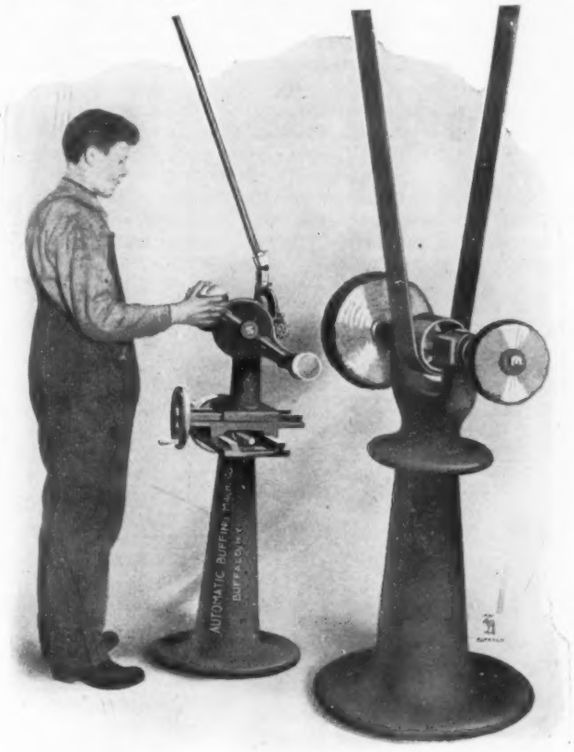
Surrounding the moving disk is a magnetic field in such relative position to the moving system or armature that it cuts or passes through the armature field and tends to rotate the moving system. This rotative movement causes the recording pen to move across the chart against the restraining force of the control springs which tend to return the pen to zero position. The turning force of the mercury-floated moving element is thus balanced against the restraining or coercive force of the control springs and their point of balance or equilibrium is measure of the current flowing in the measuring coils.

The record is made on a paper chart ruled with rectangular co-ordinates and driven by clockwork mechanism. The movement of the recording pen across the chart is proportional to the quantity measured, and the speed of the record chart is controlled by the driving clock.

The driving force of the clock is transmitted to the paper roll through a suitable gear and pinion. Three inches per hour has been adopted as the standard rate of feed, but other speeds may easily be obtained by substituting gears and pinions having different ratios of teeth. These changes may be readily made, thus enabling the meter to be employed for special tests. Full information regarding these devices can be had by corresponding with the Sangamo Electric Company, Chicago, Ill.

AUTOMATIC BUFFING MACHINE

The machine shown in cut is known as a Type K automatic buffing machine, recently put upon the market by the Automatic Buffing Machine Company, Buffalo, N. Y., manufacturers of automatic buffing machinery. These machines were designed as a result of a demand for automatic buffing machines, as applied to smaller shapes, which can be made to revolve uniformly, and which can be covered by the width of the buff, which may be shaped as the case demands. They are driven, as are all of the machines manufactured by this company, by means of an extensible shaft which permits the machine to take any position with relation to the buff without interruption, and furnishes a positive drive. Adjustments are simply and easily made. The head, when released by a trigger, revolves in a vertical plane, bringing the second piece in contact with the buff immediately on the removal of the first piece.



AUTOMATIC BUFFING MACHINE. TYPE K.

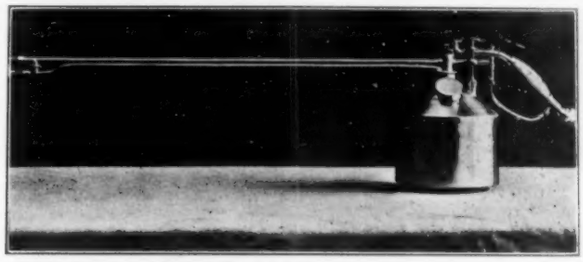
This machine is especially adapted for the buffing of clock cases, telephone bells and transmitters, small gongs and many of the smaller shapes handled by plumbing supply and lamp manufacturers. Further information may be had regarding this machine by enquiring for catalogue C. The Automatic Buffing Machine Company, 58 Indiana street, Buffalo, N. Y.

MINIMAX SPRAYERS

A new sprayer for applying lacquers, paints, enamel, Japan, bronze, etc., has been introduced into the market by The Minimax Company, New York. These sprayers are made in nine different types, one of which known as Type D, we show in the cut. This sprayer, as will be seen, has the reservoir below the nozzle and is made with short as well as long nozzles. The object of the long nozzle is to get at lacquered parts, such as interior of boxes, safes and other articles which could not be properly reached within otherwise.

The great advantage of the Minimax Sprayers lies in the arrangement and separation of the color and air nozzles, and the Minimax Company holds patents all over the world for such a device. It is manufactured in types used for the finest grade of work and for use on the smallest articles, to the painting of a house or bridge.

The Minimax Type D can be used all day without refilling, as the color or lacquer contrivance holds three gallons, and is either portable or stationary. It is not held in the hand and consequently does not tire the operator. It enables a man to work steadily and accomplish more.



MINIMAX SPRAYER, TYPE D, WITH RESERVOIR BELOW THE NOZZLE.

Another advantage claimed for the Minimax sprayer is that they can be adjusted for a fine and a heavy spray without interfering with the work, and this can be done while in operation, thus always ensuring a steady spray. It is said in regard to their efficiency and durability that Minimax sprayers outlast all other makes. Further particulars may be had by addressing The Minimax Company, 198 West Broadway, New York.

"NOFLUX" ALUMINUM SOLDER

A successful method for the soldering of aluminum has long been sought for and numerous solders have been invented for the purpose. Such a solder for which great things are claimed is now manufactured by the Reinhold Noflux Aluminum Solder Company, of Newark, N. J. This solder is prepared for the market in bars of convenient size, with proper direction sheets for each bar, so that anyone may use the same. This solder makes a joint of great tensile strength; in fact the parts when properly soldered together are stronger than the metal itself.

The Reinhold Noflux solder does not contain any mercury, lead, or any of those elements or acids which are injurious in any way to either the solder or the aluminum parts to be soldered. For this reason an electro-chemical reaction parting properly soldered joints cannot take place. No matter how long a time elapses, the soldered joint remains in the same good condition and absolutely without any deterioration as when first made. This time test is one of its best features.

The color of the solder is practically the same as that of aluminum, which is a very desirable feature; simplicity of its use is such that any person with an ordinary gasoline torch, or blow-pipe, in fact with any blue flame giving heat enough, can use it with success; it is used without a flux, thus saving considerable time, expense and bother, and providing an additional safeguard against disintegration, as most fluxes contain ingredients which attack the aluminum; and the solder flows freely and evenly.

By virtue of extensive improvements in the laboratory of the company they have been able to make a material reduction in the price of the "Noflux" solder, and it is now offered for sale at $2.80 per pound, or 35 cents per bar for the large size. Another product of this company is the Willard Filler for filling blow-holes in aluminum castings. The following directions are given for the use of this material:

Use no flux at all. Heat the casting uniformly about the blow hole with a gasoline torch, or any blue flame, until the Filler flows freely on the surface. Keep the casting well heated during the entire process and until the heat has caused the metal to absorb sufficient of the Filler to make a perfect joint. Care-

fully tin the surface of the blow hole while the Filler is in a liquid state, using a steel wire or scraper, to search it well.

Then fill up the hole with the Filler. After the surface of the hole has been well tinned, the Filler can be worked, if desired, in a semi-liquid state. Scrape off unnecessary particles before the Filler sets. Use file to even up surface after the Filler has set, if desired. Full information can be had by writing to the Reinhold Noflux Solder Company, 53 Demarest street, Newark, N. J.

CHEMICAL FLUXES

The Grasselli Chemical Company, New York, are now manufacturing a number of products used in the metal trades. Following is a short description of some of the more important chemicals manufactured by this firm.

GRASSELLI'S TINNING FLUX.

The above article is said by the makers to become a necessity in all plants where tinning of any kind is done by the old method of dipping the article into pots of molten tin and it takes the place of the old flux formerly made by the tinner himself with muriatic acid and zinc. Considering the fluctuations of the price of zinc, a contract for Grasselli's tinning flux for a year would be found more economical at even first cost on figuring the elimination of risk of breakage of carboys of acid and the uncertainty of obtaining a uniform solution at all times.

By experience it has been found that tinning flux to be thoroughly efficient should be free of all objectionable impurities, the principal ones being iron and free acid. These two impurities invariably cause trouble by spotting the work, but do not show up for a long time after the articles have been in stock. The trouble is caused by the iron and free acid which accumulate in small quantities under the tin plate and work out through this thin coating, giving the work a very poor appearance and in most cases causing a loss on account of rejection.

Grasselli's tinning flux is claimed to have every advantage over home-made fluxes, principally on account of the quick action which allows the tin to flow quickly and smoothly, insuring a perfectly bright and smooth surface on the article. It is equally efficient on sheet metal and castings of all kinds and it is not necessary to change any operations to use it. It simply replaces the home-made flux and is used in exactly the same way.

It is shipped in metal drums of 600 and 1,200 lbs., a nominal charge being made for the package and same charge allowed for package when returned.

EUREKA AND STANDARD SOLDERING FLUX.

The above products are used where any soft soldering is done. The Eureka brand is a 40-deg. solution and the Standard brand is a 45-deg. solution, both being of a similar chemical composition and are equally efficient. The first named is usually used by concerns doing light work, principally on tin, while the Standard flux is in favor by concerns who do heavy work on brass and copper. This flux is far superior to the old-style mixture of acid and zinc, principally on account of the elimination of free acid which was found so costly on account of damage caused.

These special brands of flux are said to have the advantage of doing better work than any home-made mixture, as their use insures quicker work while allowing the solder to flow quickly and adhere without any film of any kind between. This also causes a saving in solder which, although apparently is small, would be found a fair saving if figured on the yearly basis in fair size factories, as it allows the solder to flow so quickly as to not cause it to pile upon the seams and thereby not allowing any more solder to be used than is required by the work at hand. It is also an excellent flux for use on seams where solder is required to be sweated in.

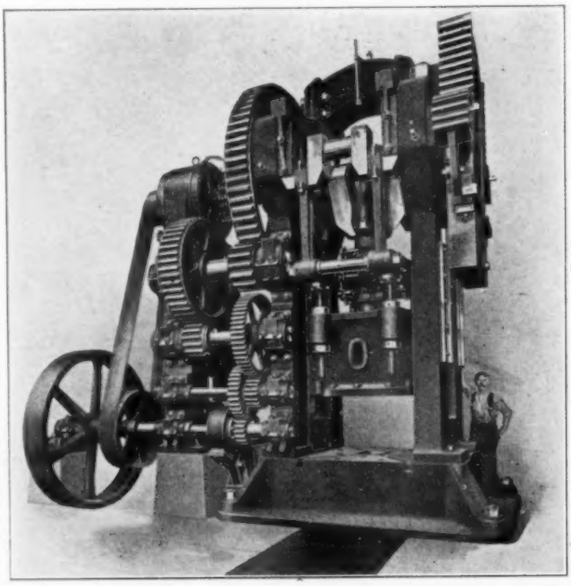
The function of a flux is to dissolve the film of oxide which covers all metal and which if not removed would be between the solder and the metal it was to adhere to, and in this way it would cause a very poor joint besides multiplying the length of time necessary, it causes the solder to set. Both of these products are to be reduced with water to the proper strength required for different work, such as general work, two parts of water to one part of flux. This brings the cost of flux down to a minimum, especially considering the elimination of risk, its high quality and efficiency.

NEW DRAWING PRESS

We illustrate in this issue a 400-ton drawing press for very heavy work which has lately been built by the A. Garrison Foundry Company of Pittsburg, and which is a radical departure in this line of machinery. The machine, as will be seen by the cut, is an extremely heavy tool, weighing about 175,000 pounds, and is adapted for such work as can be handled on a bottom platen whose area is 48 to 54 inches x 64½ inches. The novel feature of the press is the mechanism by means of which the blank holding device is operated.

This consists of a pair of mutilated gears which engage in and are driven by two racks connected to a frame, which frame is in turn actuated by means of pitman and crank, the crank being keyed to the main shaft. These mutilated gears have been cast in one piece with the gear wheel and arm, which, when the blank holder is down, bears against an adjustable face on the rack frame and is held in that position by means of a latch which slides upwards and over the face of the arm, as the rack frame rises and the racks leave the teeth of the gears.

One merit of this particular form of construction is that the blank holder has an unusually large movement; in this particular machine the lift of the blank holder is 20 inches



400-TON DRAWING PRESS MADE BY H. GARRISON FOUNDRY COMPANY, PITTSBURG, PA.

while the stroke of the ram is 28 inches. This permits a longer interval and more room for the insertion of the blank. The main advantage, however, is that on account of the construction, the dwell of the blank holder is absolute (levers are not thrown on their centers as is usual), not only does all action cease, but the crank shafts which lift the blank holder are held rigidly, being clamped in a vertical position by means of the latch and arm as shown in the cut.

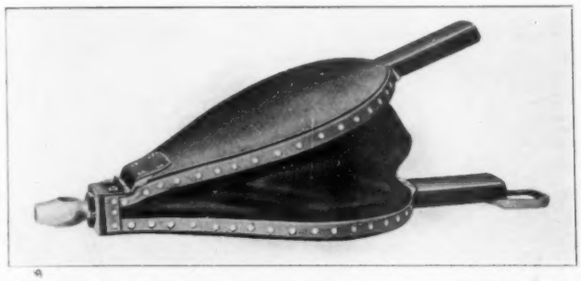
By reason of this construction the length of the dwell of the blank holder is independent of the stroke of the ram, and can not only be made any desirable fraction of the cycle of operation, but also the length of the cranks may be varied and the positive height of the blank holder may be changed correspondingly. In the drawing presses now in general use the knockout is usually operated by means of a lever and rod connecting one of the blank holding shafts with a lever operating under the bed of the machine.

In this machine the blank holder itself carries two rods which pass down through the frame, as is shown in the cut, and these rods in turn carry a cross arm, through which passes the knockout bar, it being supported at the bottom by means of a steadiment in the foundation and at the top by passing through a bushing in the bed plate. This ar-

rangement for ejecting the blanks has at least four times the mechanical efficiency of the usual appliance and is of marked advantage where the work is heavy and where blanks of unusual thickness have to be forced upward through the large dies. The stroke of the knockout rod is adjustable and can be varied from 20 inches to as little as desired. For convenience the raising and lowering of the ram is effected by means of a small motor located on the ram and the power of an 100 h. p. motor is all utilized in driving this machine when doing its heaviest work.

CANVAS BELLOWS

The Osborn Manufacturing Company, of Cleveland, Ohio, manufacturers of molding machines and foundry supplies, have just put a new molder's bellows on the market, to be known as the Osborn canvas bellows, shown in cut. This is really a new grade rather than a new model, as the innovation consists in using chemically treated canvas in place of the usual calfskin, sheepskin, or horsehide. This is, however, a point of great interest to all foundrymen, as it means equal efficiency and much longer service without increase in cost. We understand that the makers have been conducting exhaustive tests to determine this point. The results of these tests were remarkable. Under equal conditions the canvas bellows gave even better service than the ordinary bellows, and lasted fully three times as long. The great saving that this means to the user is evident from the fact that the canvas bellows cost him no more than a good extra grade



OSBORN MANUFACTURING COMPANY'S CYCLONE CANVAS BELLOWS.

sheepskin. These tests also developed some interesting points in connection with the value of the special chemical treatment given to the canvas. The makers claim that this treatment has had the following excellent results:

1.—The canvas so treated is extremely pliable.
2.—It will not split, tear or crack.
3.—It is air-tight.
4.—It is moisture-proof.

The Osborn Manufacturing Company are prepared to furnish canvas bellows in six regular sizes, varying in width from eight to fourteen inches. They are also making it in two styles: their regular molders' plain bellows, and their cyclone bellows. Both of these styles are well known to the trade as hand-made bellows, having the excellence due to the highest grade materials and finished workmanship. The cyclone possesses other points of special interest to foundrymen. Among these we may mention the fact that it has no interior obstruction to the blast whatever; also, that it has a steel hinge and aluminum spout, in which are large side holes which insure the maximum amount of wind. The Osborn Manufacturing Company, Cleveland, Ohio, will be glad to give further information to any who may be interested.

DIAMOND SNAP FLASKS

The Diamond Clamp and Flask Company, manufacturers of pattern shop and foundry supplies, Richmond, Ind., W. N. Gartside, proprietor, are putting out a line of molding flasks for which they claim a great number of prominent features which renders them superior to others on the market. The flasks are made of air-dried maple which is claimed to be equal to cherry and therefore makes the lightest flask that is consistent with efficiency and durability. The hinges of these flasks do not come loose from the wood nor do the corners get out of shape because of the superior manner in which the flask is made, being put together with screws and mitered.

The fittings, clamps, etc, are mortised into the wood and put on with bolts, therefore there are no wood screws which are always in danger of stripping and coming loose. Another very important feature relating to Diamond flasks is the fact that they are interchangeable. They are all built to a standard template and therefore will all interchange. Taken altogether, summing up the good points of these flasks as set forth by the manufacturers, it is said that the obvious way out of molding difficulties is to buy more flasks and therefore save sand and cost of molding, which will soon pay for the flasks.

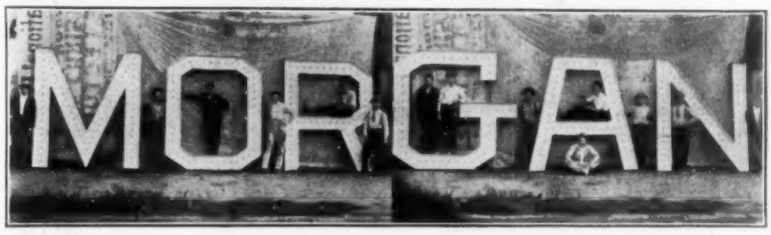
RUST RESISTING METAL SIGN

In this day of many electric signs, New York's "great white way" and the glistening avenues in every big city, new, original and even fantastic designs do not amaze. But when a real monster electric metal sign was erected on a huge smokestack in Alliance, Ohio, recently the public had cause to gape. Ac-

SHOWING THE SIGN ON THE WORKS CHIMNEY.

cording to sign writers and electricians the new sign shown in cut of the Morgan Engineering Company is the largest in the country. It is an eloquent testimonial of the value and power of electricity and a monument to every material that went into its construction.

The sign spells "Morgan," the letters being hung perpendicularly down the side of a 400-foot smokestack. It is visible a



SHOWING THE COMPARATIVE SIZE OF THE LETTERS IN THE SIGN.

mile and a half away at night and stands out a beacon at even great distances, although impossible to decipher. The sign was constructed by the Dittenhafer Sign Company, of Canton, Ohio, and it is fashioned out of the well-known rust-resisting toncan metal made by the Stark Rolling Mill Company, of Canton, Ohio.

Each of the six letters is 8 feet high, the outline of each is one foot wide, making each letter between 6 and 8 feet wide over all, while each is from 8 to 10 inches deep. The letters, hung on the side of the stack, cover a distance of 88 feet from the top of the letter "M" to the bottom of the letter "N."

Associations and Societies

DIRECTORY OF AND REPORTS OF THE PROCEEDINGS OF THE METAL TRADES ORGANIZATIONS.

THE FOUNDRY AND MACHINE EXHIBITION COMPANY

President, Geo. R. Raynor, Niagara Falls, N. Y.; Secretary, C. E. Hoyt, Lewis Institute, Chicago, Ill.; Treasurer, J. S. McCormick, J. S. McCormick Co., Pittsburg, Pa. All correspondence should be addressed to the Secretary, C. E. Hoyt, Lewis Institute, Chicago, Ill. The objects of the Association are for the commercial and technical education of iron and metal industries by co-operating with all foundry and manufacturing interests in making an annual exhibit of supplies and equipments in connection with the meeting of the American Foundrymen's Association. The next exhibit and convention will be held in Pittsburg, Pa., May 22-27, 1911.

Exposition Buildings, Pittsburg, where the National Foundrymen's Convention is to be held. Convention Hall in the foreground. Exposition Hall annexed to it and Machinery Hall in the distance. The rear of the buildings are on the bank of the Allegheny River, standing less than 500 feet from its junction with the Monongahela River and at this junction forming the great Ohio River. The buildings are within a short distance of the business center.

Secretary Hoyt reports that the applications for space have been coming in unusually well, the orders totaling twice the amount of space ordered at the same time last year or in 1909. He says:

"In the two main buildings there is 28,562 square feet of actual exhibiting space, and as applications have been received for something over 22,000 square feet, there is less than 7,000 feet of space available in these main buildings. It will probably be necessary to lay out and sell the space in the restaurant building, covering over the open court between the two buildings and build quite an extensive temporary building to the north of Mechanics' Hall. If we do this we will add something over 12,000 square feet to the total space. This cannot be done, however, unless the applications for this additional space come in very soon, as it takes time to make arrangements for this work."

The secretary therefore hopes that all firms who intend to exhibit at the coming convention will file their application blanks at once, that the proper accommodations can be provided.

Applications and further particulars may be obtained from the secretary, C. E. Hoyt, Lewis Institute, Chicago, Ill.

In connection with the convention, Secretary Richard Moldenke, of The American Foundrymen's Association, and Secretary Wm. M. Corse, of the American Brass Founders' Association, report that every effort is being made to make it the biggest convention ever held. Secretary Corse reports a number of very good papers have already been promised and many more in prospect.

ASSOCIATED FOUNDRY FOREMEN

President, Robert B. Thompson; Secretary and Treasurer, Hugh McPhee. All correspondence to be addressed to the Secretary, Hugh McPhee, 50 Cottage Place, Tarrytown, N. Y. Annual Convention with the American Foundrymens' Association.

The New York section of this association held a meeting at the Grand Union Hotel, New York, February 25, at which R. Bilz, foundry foreman for John Williams, Inc., bronze founders, read a very interesting paper on "The Production of Bronze Castings by the Lost Wax Process."

NATIONAL ELECTROPLATERS' ASSOCIATION OF THE UNITED STATES AND CANADA

President, Charles H. Proctor, Arlington, N. J.; Treasurer, H. H. Reama, New York, N. Y.; Corresponding and Financial Secretary, Geo. B. Hogaboom; Recording Secretary, Royal F. Clark. All correspondence should be addressed to the Corresponding Secretary, Geo. B. Hogaboom, 656 Hunterdon St., Newark, N. J. This is an educational society, the objects of which are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. Meets at Grand Opera House Building, 309 W. 23d St., on the fourth Friday of each month, 8 p. m.

The twenty-fifth regular meeting of the N. E. P. A. was held on Friday evening, February 24, 1911. There were thirty members present. Messrs. Nelson Bernard, Geo. D. Fleming, John J. Moriarty, and Joseph Bernath were elected to active membership.

The seal committee reported that it had purchased the seal of the association, and that it was satisfactory. The banquet committee reported that the banquet was a success. A rising vote of thanks was given to the committee and it was discharged. By a unanimous vote, Dr. Joseph W. Richards was elected to honorary membership of the association. Emanuel Blasset, Jr., suggested that the secretary write to Dr. Isaac Adams, the inventor of the nickel solution, who is now living in Massachusetts, and is about eighty-four years old, and ask him if he would honor the association by accepting an honorary membership.

L. H. O'Donnell submitted samples of black nickel plate upon cast iron articles, which were very ably executed. Mr. Haddow had several samples of black nickel-plating, and explained to the minutest detail the making, running and care of the bath. The black nickel plate upon a dead surface was an excellent specimen, in as much as black nickel has a tendency to show up grey upon mottled surfaces. Emanuel Blasset read an excellent article on producing a rust proof black finish, and exhibited samples.

The sixth regular meeting of the Philadelphia branch was held at Dooner's Hotel, February 24. Two new members were admitted. James Garde gave a short talk on McKinley gold. The banquet committee, composed of Arthur B. Wells, Hugo Hermanns and James Moore, reported progress. S. D. Benoliel, of the International Chemical Company, of Camden, N. J., will speak at the next meeting.

ITEMS OF INTEREST TO THE INDIVIDUAL.

George H. Chandler, representing the Levett Manufacturing Company, manufacturing platers' and polishers' supplies, will hereafter make his headquarters at 276 Spring street, New York. This change is made on account of the Levett Manufacturing Company's main office having been moved to their works at Matawan, N. J. Mr. Chandler will look after the trade in the New York district, giving considerable of his attention to the export trade.

Thomas F. Jordan, the well-known plater, has taken charge of the plating room of the R. E. Dietz Company, 60 Laight street, New York, large manufacturers of lamps with several branch factories. Mr. Jordan was with the Edward Miller Company, Meridan, Conn., for a number of years, and recently had charge of the plating for the Remington Typewriter Company, of Ilion, N. Y.

Hugh McPhee, Tarrytown, N. Y., announces that he has resigned his position as foundry superintendent for the Maxwell Briscoe Motor Company, and will hereafter devote his time exclusively to introducing his new process for mounting patterns on plates to foundrymen throughout the United States and Canada.

George M. Griffith, Calvert building, Baltimore, Md., is reported to be directly interested in the Maryland Metallizing Company, which will be formed with a capital stock of $100,000, to engage in the manufacture of metallized products. Their process involves the metallizing of wood, plaster Paris, etc.

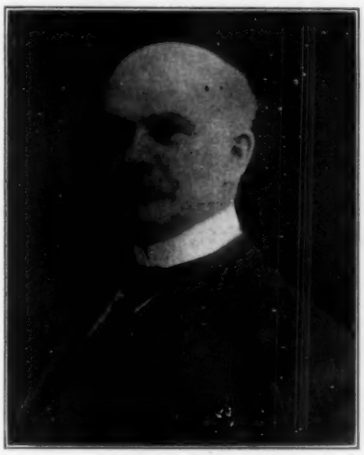
E. F. Lake has severed his connections with the American Machinist as Steel Editor, and will engage in consulting metallurgy at Avenue B and Forty-seventh street, Bayonne, N. J. Expert advice will be given on the melting, alloying, casting, welding, heat-treating and testing of metals.

Martin Burns, for the past twelve years foundry superintendent of the Lunkenheimer Company, Cincinnati, Ohio, has resigned his position, and has opened a jobbing foundry to be known as the Cincinnati Brass and Aluminum Company, at 2129 Barnard street, Cincinnati, Ohio.

DEATHS

CHARLES M. DALLY

Charles M. Dally, of New York, died January 27, at Fortress Monroe, where he had gone to witness trials of position finders. Mr. Dally was born in New York in 1846, and at the age of fifteen or sixteen started as a boy with the Novelty Iron Works of Brooklyn. For the last five or six years he has been the American representative of the Bates & Peard Annealing Furnace Company, manufacturers of furnaces for annealing metals without oxidation, Liverpool, England.

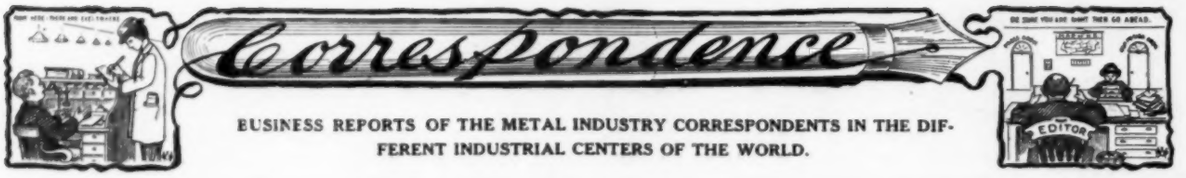


CHARLES M .DALLY.

Previous to that time Mr. Dally was engaged in the sale of war material, and in inventions in this line. He was looked upon as an authority in ordnance matters, and secured the adoption of the Leigh magazine rifle by the British War Office, and introduced the Harvey armor plate into Russia. During the Boer war he was thanked by the British government for services he rendered relating to field artillery.

JAMES McTAGGART

As we go to press we learn of the death of James McTaggart of Dayton, Ohio. Mr. McTaggart was until recently superintendent of the foundries of The National Cash Register Company, Dayton, Ohio.



BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS IN THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

BRIDGEPORT, CONN.

MARCH 6, 1911.

Since the opening of actual legislative activities in February, manufacturers of every persuasion has been compelled to watch their business with one eye, and with the other, the would-be depredations of cranks, theoretical reformers and closed shop labor unions. The biggest problem of course, was the workmen's compensation and employers' liability proposition, to which both political parties and the governor more or less committed themselves in the last State election. The legislature must now cope with seven conflicting bills under this head, as a result.

Profiting by the almost ruinous experience of many New York manufacturers, under the new laws of that State, the employers of Bridgeport have done their utmost, in cooperation with the newly formed "Manufacturers' Association of Connecticut," to persuade the two legislative committees charged with the duty of recommending some legislation of this character, to stand together in support of a statute which shall be at once an automatic insurance to injured and contributing workmen, and a reasonable, as against confiscatory, charge upon the insurance account of the employer. At this writing, four hearings have been held, with the Bridgeport Socialist Party holding out for its particular bill, as against three others supported by as many labor organizations.

Nor are legislative matters alone in diverting the immediate attention of local manufacturers from the quiet pursuance of their legitimate businesses. Bridgeport has grown so rapidly in the last decade, that already factory properties adjoining railroad or water routes have become unavailable, and with the continual influx of new industries, attracted by the traffic and trade advantages of this location, has come the problem of where to put them. The proposition to annex all or a part of the town of Stratford, is gaining favor daily. It must be consummated in the natural order of things, sooner or later, and Bridgeport will ultimately have within its borders, the finest rail and deep water facilities, coupled with industrial condition and proximity to the New York market—in the East. Business is distinctly improving in all trades, and despite the pessimistic forebodings of some manufacturers anent the recent freight rate decision by the Interstate Commerce Commission, will steadily continue to improve.—M. E. B. G.

PROVIDENCE, R. I.

MARCH 6, 1911.

The month of March opens with a slightly decreased activity in practically all lines of the metal industries in this city and vicinity. There is a material slackening off in the manufacturing jewelry business, except in a few instances. Generally speaking, however, the business men seem to believe that it is simply a temporary lull before a storm of orders that will rush everything until the close of the year. One of the most noticeable features of the situation in connection with the jewelry business is the large number of important changes that have occurred during the past fortnight, together with removals. The Amasa Mason block on Eddy street, which for more than three decades has been occupied by a number of small manufacturing jewelers and allied trades, has recently changed ownership, and the new owners are desirous of having the entire building vacated at once. Notices were given legally to all tenants to vacate by April 1, but after a conference by a committee of the tenants with the owners, the time was extended to August 1. This sudden demand for nearly twenty medium sized shops emphasized the scarcity of vacant shops, and there are rumors that one or more buildings for factory purposes are soon to be erected in the heart of the jewelry district. Of the firms in the Amasa Mason building three have already moved to new locations. These are C. H. Ballou & Company, Donley & Company, and Crossin & Company, all having secured shops at 144 Pine street.

S. K. Merrill & Co., after being in the Champlin building, corner of Ship, Clifford and Chestnut streets, for nearly a quarter of a century, are moving to the A. T. Wall building, on Clifford street, where the entire top floor has been leased. H. J. Astle & Company has the contract for fitting up the shop and offices for this firm, and is doing some unusually fine work. When completed the Merrill shop will be the most modern equipped of any jewelry plant in the city.

George N. Steere, who recently disposed of his holdings in the George N. Steere Company, manufacturing jewelers at Pawtuxet, to the remaining stockholders, has purchased an interest in the old-time manufacturing jewelry concern of Payton & Kelley Company, at 31 Sabin street, and will assume to a large degree the management of the business. At a meeting of the stockholders a few days ago the entire policy of the firm was discussed, and the future outlined. Mr. Steere was elected as vice-president, secretary and general manager; Samuel E. Kelley was re-elected president, and Samuel J. Greene was re-elected treasurer.

The Tilford Manufacturing Company has been incorporated, with a capital stock of $6,000, for the manufacture of jewelry and other novelties incidental thereto in this city, according to articles of association just filed at the office of the secretary of state. The incorporators are George H. Tilford, George H. Huddy, Jr., and Stanley A. Berry, all of this city.

Charles W. Greene, of Warren and Benjamin F. Norton and Jeremiah Wheeler, of Swansea, have formed a corporation under the name of the North Swansea Manufacturing Company, according to papers filed at the office of the secretary of state. The company will carry on the manufacturing jewelry business in the same building in which the D. R. Child Company and later the Standard Novelty Company conducted the same industry at North Swansea, near the State line. The plant was established about thirty years ago by Daniel R. Child, and about seventeen years ago Lorenzo P. Sturtevant bought out the business, but retained the firm name of D. R. Child Company.

Mark E. Nickerson and Richard C. Sanderson, of Pawtucket, and James J. McGinnity, Jr., Harry W. Smith and Charles G. Smith, all of Attleboro, have received a charter under the caption of the Nickerson Art Metal Company. It is authorized to make, buy and sell metal goods and novelties, metal findings, automatic machinery, wire goods, mesh purses and mesh purse accessories. The company is located at 18 Water street, Pawtucket, and is capitalized at $100,000, with shares at $100 each.

The members of the company are as follows: Mark E. Nickerson, treasurer; Richard C. Sanderson, president; Henry W. Smith, vice-president; James J. McGinnity, Jr., secretary, and Charles G. Smith. Of these, Mr. Nickerson is treasurer of the Pawtucket Baking Company and a member of the Pawtucket Common Council from the Third ward; Mr. McGinnity has been a traveling salesman for the past three years for the Bell Findings Company and the Jewelers' Finding Company of Attleboro. Mr. Smith was formerly in the employ of the American Watch Tool Company of Waltham, Mass., and Charles G. Smith is the inventor of the machine which makes the purse mesh. He is a graduate of the American Waltham Watch Company, and inventor of fifteen different machines, several of which are on the market today. The mesh bag department of this concern is working two shifts a day, as the demand for this class of goods is active.

The firm started in business about a year ago, and has a New York office at 41 Maiden Lane.

The H. J. Astle Company is introducing a polishing system for the new firm of Moore & Lonergan, of Attleboro. This firm does not confine its work wholly to manufacturing establishments. It is now introducing a large ventilating system in one of the prominent downtown lunch rooms of this city. The firm has all the work on hand at present that it can attend to for a number of months to come.—W. H. M.

NEWARK, N. J.

MARCH 6, 1911.

The spring demand for jewelry is pretty good, and the factories are about as busy as usual for this time of the year. Preparations have been made for an active year, and quite a number of the manufacturers have enlarged recently or are preparing to do so, and many are seeking new quarters. The removals always create a demand for new machinery, tools, supplies,, etc. All the salesmen are out and reporting fairly good business, the West in the lead, followed by the South. The demand in the East is fair, but not as strong as in the West. Gold goods are selling readily; silver lines are in strong demand, and novelties are fast sellers.

Stevens & Leithoff have moved their factory for the making of gold goods and lorgnettes, from 61 Arlington street, to Grace and Cottage streets, Irvington. They have been making some new lines, have much larger quarters, having built their own factory, are busy and turning out a larger output.

The Keystone Optical Company have incorporated at Elizabeth, N. J., with a capital of $125,000 to manufacture optical goods, machinery, tools, and instruments, headed by Abel D. Bloch, Benjamin Bloch, and Bernard Bloch.

The New Jersey Smelting and Refining Works started in business not long ago at 131 Clifford street, headed by Clarence Curran, late of the Elizabethtown Smelting Company. They are smelting and refining gold, silver, platinum, iridium and copper. Have built about thirty furnaces and three 90-ft. chimneys. A general sweep business is being taken care of, and they are having a nice trade.

William J. Bailey, manufacturing tools and dies, moved not long ago from Columbia street to 8 Johnson street, where he has 5,000 feet of factory space. He is making a new line of findings, and the output is considerably more.

Louis V. Aaronson, Jennie F. Hayes and Waldron M. Ward organized the Aronson Specialty Company at 5 Mulberry street, and are making metal ornaments of brass and bronze, with a capital of $150,000.

The Peninsular City Casting Company has started in business as brass founders at 13 West Ninth street, Bayonne, N. J. They will make brass, bronze and composition castings.

The Whitehead & Hoag Company, who are one of the largest badge and novelty makers of the country, have moved from Warren and Washington streets to First street and Sussex avenue.

Theodore A. Sippel, of 205 McWhorter street, is putting out some good things for the jewelry and plating lines. One is a high-pressure sand blast with a new nozzle, also does sheet iron work for the trade.—H. S.

PITTSBURGH, PA.

MARCH 6, 1911.

Marked improvement in general business conditions throughout the Pittsburgh district has been noted during the month of February, and manufacturers in metal lines are particularly optimistic for the spring, owing to increasing inquiries and gradual swelling in volume of business. Among the brass foundries the plants working on specialized lines report unusual activity at this time, in some of the plants capacity being taxed and often failing to meet the current demands. The copper trade is less active, but improved over the opening month of the year, and officials of these companies say that in another thirty days there should be a more decided change for the better.

The aluminum demand is still rather off color. The Aluminum Company of America, reported the past few days, that a slight gain had been noted in demand over the earlier month of 1911, and this is perhaps the first actual signs of a betterment for over seven months. The encouraging signs are noted in the increasing activities among consuming lines, which mean the absorbing of surplus stocks in a short time and a general call for new supplies. A campaign of education in broadening the uses of aluminum among industries that would increase more sharply the consumption of this metal has been conducted quietly and effectively. It is believed for this reason that when the trade once revives to a normal extent that it will continue on a broader scale than ever before.

In the vanadium market there has been a depression owing to the close tie between this trade and the steel industry, but in spite of this the plant of the Vanadium Company of America has been able to operate quite steadily until this week, when labor troubles developed and a strike of mechanics there affected its operations temporarily. Lead burners, electrical workers and steam fitters are involved, and eighty-five men quit work on Saturday, March 4, because of a refusal of a demand for time and half time for all overtime and Sunday work. The new Aluminum Mines Company of Pittsburgh, which was organized a year ago, starts its reduction works for the first time in Braddock borough this month, and becomes a producer of vanadium from ores shipped from New Mexico. This leaves the entire vanadium supply of the world centered in Pittsburgh, so far as commercial purposes are concerned.

An interesting series of demonstrations have been going on in Pittsburgh during the past four months, under the direction of Martin M. Kallman, with the assistance of W. S. Rockwell, of the W. S. Rockwell Company of New York, furnace builders, for gold, silver and copper plants, and also aided by A. Victorin, a noted engineer, which promise to arouse keen interest in the metal world. The demonstrations were with the use of a new alloy known as "transformetal," which, applied with a heat of 1,600 degs. Fahr., to the baser metals, as iron and steel, transforms them from low carbon soft or mild steel into a marvelously high carbon or tool steel, impenetrable with drill, and the applying of such treatment is under a perfect control. The same demonstrations are said to be practical in all metals, and it is understood to be the intention of the controlling syndicate to develop this process in the broadest possible manner.

On the third Wednesday of this month the annual banquet of the 24-Karat Club of Pittsburgh is to be held at the Fort Pitt Hotel, and will bring together all of the leading jewelers and jewelry manufacturers of Western Pennsylvania, eastern Ohio and West Virginia. The event is always interesting to this extensive trade, and to gold and silversmiths. Incidentally the gold and silver markets appear to be passing their usual quiet period of the tail end of winter and opening of spring, but not below the normal for this time. Platinum demand is excellent, the leading manufacturer and worker of Pittsburgh reporting a remarkably busy season through the opening months of the new year.

The Pittsburgh district, which has been under the influence, or, rather, under the spell of the depression that swept the country during the early portion of 1910, is shaking herself once more, and getting down to real life. Not only industrially, but as a community. Building operations have not been so extensive in years as they are at present, and the commercial life has shown a remarkable animation.—W.

BUFFALO, N. Y.

MARCH 6, 1911.

Trade conditions in Buffalo are normal. The usual after-Christmas slump is not wholly missing among the manufacturing jewelers, yet February closed with satisfactory reports, and the prospects for the spring and summer are most encouraging. Collections are easier and the reports from travelers show that financial conditions among the jewelers at least are ahead of last year at this period. King, Raichle & King, wholesale jewelers on Main street, report excellent trade. Their travelers were all out during January and Feb-

ruary, and sales are entirely satisfactory. A fine new building, now in process of construction on Pearl and Huron streets, will, when completed, be occupied mostly by jewelry firms and manufacturers of novelties in bronze and copper.

The Niagara Ring Company and the Queen City Ring Company have made plans to move there about the first of May, and handsome quarters are being finished for them. Manager Schopp of the Schopp Manufacturing Company has advertised a closing out sale of his retail jewelry department in Ellicott Square. He will devote his entire time to the rapidly increasing business of the Schopp Manufacturing Company, of which he is president.

Adam Smith, for the past seven years with White, Wile & Warner, manufacturing jewelers, is now manager of the Schopp Manufacturing Company.

According to certificates filed in the county clerk's office recently, the Pneumatic Metal Tire Company, capitalized at $50,000, has been incorporated. The head offices will be in Buffalo. The directors of the company are Albert E. Nelson, Edward L. Kunz and George C. Graves.

The Water Vacuum Company has been incorporated with a capital stock of $50,000. They will make and sell vacuum cleaners of simple construction and moderate cost. The officers are C. C. Trow, president; H. C. Redfern, treasurer, and J. P. Clifton, secretary.

Commissioner George V. Horgan, of the Bureau of Industries for Buffalo, has announced the location of a new industry for this city. It is the local branch of the Positive Clutch and Pulley Works of Toronto, and they will occupy a three-story building on Lansing street, and it will employ about 100 men.—McG.

CLEVELAND, OHIO

March 6, 1911.

Business with the big metal producing and handling firms in this territory is showing more activity as the spring approaches. General business conditions are reviving in a very satisfactory manner and despite the recent flutter over the adverse decisions in the railroad rate cases, there seems little doubt that things will boom along better this year than for several seasons.

The big auto show, held last week in Central armory, was a great success and gave every indication that the auto business is in a thoroughly healthy condition in this city and neighborhood. Many sales of cars are being made and the factories are speedily resuming full time schedules in all departments. The Croxton Motor Car Company, formerly located at Massillon, Ohio, has undergone a reorganization and has located in Cleveland, having leased the plant formerly occupied by the Baker Motor Vehicle Company. The new concern expects to do a big business during the coming year. The Darke County Auto Company has been incorporated at Ansonia, Ohio, by E. M. Pierce and others with a capital of $20,000 to engage in the manufacture of automobiles. All the Cleveland plants are preparing for a big rush of business and additions to the buildings and equipments are being made to most of them.

Business with the big plumbing fixture concerns here is reported as active in anticipation of a big building season. The reports for the first two months of the present year indicate that more building is under way than ever before in this locality and the plumbing fixture making firms are sure of getting their share, for never before have so many sanitary devices been included in the home as at present.

The Wise Soda Apparatus Company, which recently built a new factory at Bellevue, Ohio, has moved its headquarters to that place where it will continue to engage in the manufacture of soda fountain appliances of all kinds. The Bishop & Babcock Company, of Cleveland, which makes fountains on a big scale, reports that business this spring and summer is likely to be unusually good.

The Alliance Brass & Bronze Company of Alliance, Ohio, has been formed with a capital of $15,000. Its chief incorporator is Charles W. Smith. The firm will engage in a general brass and bronze business.

The National Metal Reduction Company, of Cleveland, is another firm incorporated during the past month. It has a capital of $10,000. The incorporators are A. D. Levi, Max Stotter, S. M. Pice, H. Rosenblatt and G. Rosenberg.

Within the next week or two bids on the lighting fixtures in the new court house, estimated to cost over $100,000, will be opened by the county building commission which is in charge of the work of erecting the new building. An effort to cut up the contract so that the fixtures for the interior might be separated from the large bronze pillars for the outside has failed, though prices will be obtained on both branches of the work. It is possible that the exterior pillars may not be contracted for immediately. All the interior fixtures are to be made of solid bronze, of very simple but massive designs.

Charles S. Brookins, for over ten years general manager and vice-president of the Morreai Company, gas and electric fixture manufacturers, has sold his interest to the concern and has organized the Brookins Company to engage in the same business. The new company has been incorporated at Columbus with a capital of $50,000. Those who control the concern are C. S. Brookins, B. D. Munhall, W. B. Chapman and H. W. Wilkins. A general line of fixtures will be manufactured.—McM.

SAN FRANCISCO, CAL.

March 6, 1911.

Brass and zinc foundries, chandelier factories, electroplating shops and jewelry manufacturing plants have been running full handed, and without exception have orders ahead. The Panama-Pacific-International Exhibition, as decided by both houses of Congress by a large majority against her competitor, New Orleans, La., is to be opened the first or thereabouts of January, 1915 in San Francisco, to celebrate the opening of the Panama Canal, and you youngsters down East can be assured that this International Exhibition will reflect credit on the United States. It's only a few months ago our business men got together and subscribed $7,500,000 in just about one-half hour, and organized the exhibition company; so far so good; it has helped to stimulate trade all around.

After the completion of the Panama Canal, San Francisco will be the world's trade center and natural distributor east and west, north and south. The manufacturing of hardware, tableware, fixtures, plumbing goods, etc., will mostly be benefited, and is bound to be a factor in the world's market. The abundant and diverse resources of California are impartially awaiting both labor and capital. If climate and other physical conditions insure handsome rewards to capital and labor, we must rejoice if both enjoy generous returns.

The California Artistic Metal and Wire Works are forging to the front in casting art bronze castings. One of this firm's masterpieces is the Sather memorial gate, at the Telegraph avenue entrance to the University grounds, Berkeley, Cal. Louis de Rome, 150 Main street, is another brass and bronze foundry which is gaining in reputation, turning out statue work equal to Paris craft; every department is busy, art plates and statue castings being shipped to the Islands, Mexico, British Columbia, and to the Rocky Mountain States. The Ball Propeller Company, 225 Protrero avenue, is getting ready to turn out their new propellers, which will excel any in use on this coast for speed.

W. T. Garratt & Co., the oldest brass foundry and steam heating, fitting and valve manufacturing establishment in the city, have at last rebuilt their works since the fire of 1906, and report business good. The Dow Pumping Engine Company, 179 First street, are also rebuilding their brass foundry; it will be equipped up to date. The Superior Plating Works, Howard and Sixth streets, and the Cappuzzi Plating Works, Clementina and Third streets, have been started anew in the last few months.

The Crown Fixture Manufacturing Company, 643 Mission street; San Francisco Plating Works, 1349 Mission street; United Lighting Fixture Company, 1163 Howard street; California Gas Fixture Company, 357 Ellis street; S. Lissen Bronze and Plating Works, 1057 Folsom street; Callonan Electric Fixture Manufacturing Company, 3239 Mission street; Moise, Klinkner Company (metal novelties and stamp works), 1212 Market street, all report business good.

Increased activity is noted all along the coast in manufacturing industrial development; also railroad extensions. Building activity is increasing all over the State, indicating rapidly increasing population.—L. G.

TRADE NEWS

TRADE NEWS OF INTEREST DESIRED FROM ALL OF OUR READERS. ADDRESS THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK

ADDITIONAL TRADE NEWS WILL BE FOUND UNDER "CORRESPONDENCE."

The General Chemical Company moved their Philadelphia office some time ago from the Bourse Building to 712 Lafayette Building.

A brass foundry has been started by Thomas Brown, Groton, Conn. At the present writing the foundry is nearly ready for operation.

F. B. Bayless announces that he has sold his laboratory interests to the Bayless Sons Company, who will continue to conduct the Bayless Chemical Laboratory of Muncie, Ind., as heretofore.

The Atlas Brass Foundry, Inc., Boston, Mass., states that while the company's plans are not sufficiently matured to give out details, it is very likely that it will soon succeed to the business of the Bay State Brass Foundry.

The Baird Machine Company, Oakville, Conn., states that the published reports regarding their plans for their new plant at Bridgeport, Conn., are without their knowledge or authorization, and that their plans have not yet advanced far enough for announcement to the public.

The Star Brass and Iron Bedstead Company, Brooklyn, N. Y., which recently sustained damage by fire, report that they have resumed the manufacture of brass and iron beds in the uninjured part of their factory, 20-22 Milford street. The question of rebuilding on the old site has not been definitely decided.

The General Manufacturing Company, manufacturers of steel balls for tumbling, special rivets, screws, studs, etc., Waterbury, Conn., have installed a new equipment to meet the demands of their rapidly growing business. The capital stock of the company was increased to provide funds for these improvements.

The report, published in the daily press, concerning a find of platinum in Texas is not regarded as authentic by the United States Geological Survey, Department of the Interior. The Survey says that this locality has been known for years and although a trace of gold and silver has been found no platinum has as yet been discovered.

At the annual meeting of the Haydenville Company, Haydenville, Mass., recently held at the office of the company in Jersey City, N. J., a dividend of 5 per cent. was declared, payable March 15-30. The following officers were elected: C. J. Hills, president; A. S. Hills, vice-president and treasurer; R. B. Hills, secretary; all of Haydenville.

The Gray-Hawley Manufacturing Company, Chicago, Ill., reports that their new factory will be 88 x 200 ft., the front part being two stories high contains the offices, vaults, finished stock room, salesroom and experimental departments. The building is of brick and concrete construction and was ready for occupancy March 1. This company manufactures motor car and boat accessories.

W. J. Smart, president of the Eureka Pneumatic Spray Company, 276 Spring street, New York, announces the opening of the Epsco Studios at the above address, where a specialty will be made of finishing fine statuary, groups and medallions with the Epsco art finish. This is an entirely new finish in imitation of bronze and the results secured with it are said to be remarkably good.

The American Sanitary Manufacturing Company, manufacturers of brass goods, Abingden, Ill., whose plant was moved from Detroit, Mich., last year, report that their large new factory, with foundry and complete brass works, is now running full of orders. This plant, which is one of the recently constructed ideal plants for the manufacture of brass goods, was equipped and fitted up by the Hannifin Manufacturing Company of Chicago.

Clum & Atkinson, brass founders and manufacturers, Rochester, N. Y., opened a branch office February 1 at 131 La Salle street, Chicago, which office will be in charge of the Ward-Bell Company, for the soliciting of brass, bronze and aluminum casting and babbitt business in that locality. This company also has an office at 50 Church street, New York. This concern is now specializing on the extra heavy brass work, and also castings of ordinary weight in extra large quantities.

E. H. Schwartz, the inventor of the Schwartz furnaces, manufactured by the Hawley Down Draft Furnace Company, and later with Kroeschell Bros., having gotten up the Kroeschell furnace, has severed his connection with the latter firm, and has organized the firm of E. H. Schwartz & Son, with address for the present at 519 Center street, Chicago. They will manufacture a full line of melting furnaces for brass, bronze, aluminum, iron and steel, and do a general metallurgical engineering business.

The law offices of Richard James Donovan, 170 Broadway, New York, announce that the Inter-State Commerce Commission has ordered a reduction of 25 per cent. in the express rates to and from New York and Brockton, Whitman, Rockland, Taunton, North Attleboro, Mass., and Pawtucket, R. I., This rate took effect February 6, 1911, and applies to what is known as the "Boat and Rail Line." Small packages must be marked "Boat and Rail," otherwise the express charges will be one dollar per hundred instead of seventy-five cents.

The Lewis Electric Welding and Manufacturing Company, Toledo, Ohio, which has been incorporated with a capital stock of $10,000, manufacturers of electric and mechanical appliances, report that they make a specialty of valves for automobiles, stationary and marine motors, and also do a general electric welding business. While this company has been in business for only a little over a year the general progress has been such that it was found necessary to incorporate, and it is expected that a new building will be required in the near future.

The Chicago Foundry Foremen's Association held their annual meetings and banquet in the Louis XVI. Banquet Hall in the new Sherman Hotel, Chicago, Saturday evening, February 11, which was attended by some one hundred and fifty members and their guests. The principal speeches were delivered by Hon. Wm. E. Mason, formerly U. S. Senator from Illinois, on "American Citizenship"; Mr. Herman O. Lange, of Chicago, on "Observations"; Mr. George Woodruff, of Joliet, Ill.; on "International Trade Opportunities." The Men's Glee Club, of the Lewis Institute, furnished the music.

A congress of technology will be held in Boston, April 10-11 of this year. The first of these dates is the fiftieth anniversary of the chartering of the Massachusetts Institute of Technology, and the primary purpose of the congress is to fittingly mark that anniversary. A series of papers will be presented at this congress, which will constitute a survey of engineering and industrial sciences as a whole from a body of men who speak from first hand experience with industrial problems all over the country. No similar discussion of the industries has been attempted on such a scale and the experiment promises to be of unique value to the country. The meetings will be open to the public.

The Consolidated Casting Company, manufacturers of brass, bronze and aluminum castings, valves and faucets, stove trimmings and hardware specialties, has been organized with factories at Mechanicsville and Syracuse, N. Y. This corporation has been formed to combine the interests of the Turnbull-Smith Company of Syracuse, and the W. F. Green Company of Mechanicsville, with a total capitalization of $200,000. The main office of the consolidation will be at Mechanicsville, N. Y. The W. F. Green Company's stove trimmings, which have been known to the trade for over twenty years, and the Turnbull-Smith Company's bath, basin and sink bibbs, also their superior castings in brass, bronze and aluminum will be manufactured at Mechanicsville, but the Syracuse foundry will still continue to produce castings in the above metals.

B. E. Rockhoff, secretary of the Fostoria Aluminum Manufacturing Company, manufacturers of aluminum castings of all descriptions, Mishawaka, Ind., reports that the brass and aluminum foundry now being erected by his company will have a daily capacity of 2,500 pounds of aluminum, or 7,500 pounds of brass. The foundry building is 65 x 95 feet, and built of concrete and steel. There is also to be an office and pattern storage building which will be a fireproof structure 22 x 24 feet. In the planning of this foundry special attention has been given to the economical turning out of the highest class of work, together with the most modern equipment. It is believed that it is one of the best arranged foundries of its size in the country. The equipment includes oil burning furnaces, core ovens, molding machines and a plating and polishing equipment will also soon be added.

The Levett Manufacturing Company, Matawan, N. J., manufacturers of platers' and polishers' supplies, announce a reorganization of their executive force, C. T. Bowes, having been appointed general manager. Some time ago serious friction developed between some of the stockholders and officers but all disputes have been amicably adjusted and all connected with the company are looking forward to a period of unprecedented prosperity for it. The company's main office has been moved from New York to the works at Matawan, N. J., the change having been made to facilitate the handling of orders. The New York City trade will continue to be attended to by George H. Chandler, whose headquarters will be at 276 Spring street, New York. Other representatives are F. J. Clark, for Massachusetts, Connecticut and west to Buffalo, N. Y.; P. H. Bergin, for Philadelphia, part of Pennsylvania, Ohio and Michigan; G. S. Bowes, for Jersey City, Newark, Hoboken, New Jersey; Ernest Lamoureux, for Chicago and Western territory.

REMOVALS

The Hudson Brass Foundry, formerly of 134 W. 39th street, New York, manufacturers of brass, bronze, composition and aluminum castings of every description, are now located at 97-99 Cliff street, corner of Frankfort street, New York.

INCREASE OF CAPITAL STOCK

The capital stock of the Chicago Bearing Metal Company, Chicago, has been increased from $250,000 to $500,000.

The capital stock of the Elkhart Brass Manufacturing Company, Elkhart, Ind., has been increased from $25,000 to $60,000.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Correspondence" columns.

THE ALUMALOYD PRODUCTS COMPANY, Canton, Ohio. Capital stock $350,000. To manufacture aluminum sheets and products.

CLEVELAND ALLOYS COMPANY, Cleveland, Ohio. Capital stock, $30,000. To manufacture aluminum solder, bearing metal and kindred products. Officers: M. I. Dryfoos, president and secretary; H. R. Dryfoos, vice-president and treasurer; R. H. Wall, manager, all of Cleveland.

DETROIT FOUNDRY AND MANUFACTURING COMPANY, Detroit, Mich. Capital stock, $50,000. To manufacture brass, aluminum, sheet metal work, automobile parts and accessories. Officers: John T. Rich, president; Dr. D. A. MacLachlan, vice-president; Jonathan Palmer, Jr., secretary; George E. Lawson, treasurer, all of Detroit.

PRINTED MATTER

RIVET HEATING FURNACES.—Bulletin No. 27, issued by the Rockwell Furnace Company, New York, gives descriptions of the various types of oil or gas fuel rivet heating and forging furnaces manufactured by this company.

BABBITT METALS.—A description of a series of babbitt metals, which collectively are claimed to cover every requirement, is given in a little brochure published by the Lumen Bearing Company, brass founders, Buffalo and Toronto.

FURNACES.—Bulletin No. 33, issued by the Hawley Down Draft Furnace Company of Chicago, gives illustrations and descriptions of the Hawley-Schwartz melting furnaces for brass and aluminum, which are fired either by coal or gas fuel. Some interesting arguments are given, setting forth the advantages of these furnaces over crucibles. Copies on request.

MONEL METAL.—An extensive booklet has been issued by the Bayonne Casting Company, producers of Monel metal, brass and bronze alloys, Bayonne, N. J. This booklet gives probably the most complete information regarding Monel metal, a natural nickel-copper alloy, that has ever been published, and makes a valuable addition to existing literature on metal alloys.

HARDENING FURNACES.—How to harden tool steel is told in a 24 page booklet written by H. B. Eaton, and distributed by the Simplex Tool and Supply Company, of Boston, Mass. The story of hardening steel is told by Mr. Eaton in a very interesting manner and the various classes of furnaces designed and built for the purpose by the Simplex company are illustrated and described. The booklet is free upon request.

ALUMINUM SOLDER.—The Aluminum Solder Company of Boston, Inc., have issued a booklet giving description of the no-flux solder manufactured by this company, which is sold under a guarantee that the solder will in every respect come up to a standard test made by the Massachusetts Institute of Technology. This solder is adaptable for the repairing of aluminum castings of all kinds, and also for soldering silver, bronze and brass to aluminum.

ABRASIVES.—Under the title of "Do You Know the Following Facts About Emery?" H. A. Stiles & Co., 161 High street, Boston, Mass., have issued a four-leaf folder in which they set forth some factory facts about emery. They explain the salient features of the cost difference, the different methods of producing emery, the quality of raw material, the shape of the grain, packing the material, and finally they guarantee every keg of H. A. Stiles and Co.'s emery. To all users of abrasives the folder is of interest.

PYROMETERS.—The Bristol Company, manufacturers of Bristol's recording instruments, have issued Bulletin No. 130, relative to the William H. Bristol electric pyrometers. This bulletin is a 56-page illustrated catalogue and includes description and lists of both indicating and recording forms of these pyrometers with explanation of the special patented features, as for instance basic patents on means of compensating readings of thermo electric pyrometers for changes in cold end temperature. On pages 48 to 55 of this catalogue partial list of more than 700 users of Bristol pyrometers is given.

AD NEWS

F. J. Lederer Company, Buffalo, N. Y., are advertising the "Peer" exhaust fans and blowers in this issue.

The Michigan Smelting & Refining Company, Detroit, Mich., have begun in this issue to advertise their products.

C. W. Leavitt & Co., Hudson Terminal, New York, importers of and dealers in metals, call attention in their advertisement to the value of magnesium for the elimination of blow holes in castings.

The Levett Manufacturing Company announce in the advertising pages that they have moved their main office from New York to their works at Matawan, N. J. This move has been made to facilitate business.

The Riehl Manufacturing Company, 5411 Bower avenue, Cleveland, O., continue to advertise the Riehl wire wheels. They manufacture tampico brush wheels, and wire scratch wheels in any size. Their new illustrated catalogue "R" will be sent on request.

The Morgan Manufacturing Company, Newport, R. I., have a card in this issue calling attention to their facilities for brazing small copper, brass, steel and iron pipes. The company has a complete brazing plant and makes a specialty of brazed connections for the automobile trade for acetylene, gas, oil and water purposes.

The American Oil & Supply Company, Newark, N. J., manufacturers and dealers in all kinds of jewelers', platers' and polishers' supplies, are advertising in this issue the Flexible Abrasive Emery Wheel. This wheel has made some remarkable records in grinding and polishing pipe. It is particularly suitable for this purpose and can also be applied to many other classes of work.

August Buermann, 220 Jelliff avenue, Newark, N. J., is inviting inquiries for all kinds of brass, bronze and aluminum castings. This company has a new foundry which is thoroughly equipped for turning out high grade work at low cost. They also have facilities for finishing the castings in any form desired, and will contract to manufacture articles complete from the casting to the finished product.

The Albany Sand and Supply Company, Albany, N. Y., producers, shippers and exporters of the famous Albany Molding Sand, have an advertisement on the front cover of this issue. They furnish carefully selected and graded sand for aluminum and brass work, and call particular attention to their large capacity and prompt service. This firm also handles sand blast sand, fire sand and clay, sea coal facing and Ceylon silver lead.

The Reinhold Noflux Aluminum Solder Company, Newark, N. J., announce on another page that they have reduced the price of Reinhold Noflux Aluminum Solder from $4 to $2.80 per pound. This reduction has been made possible by improved laboratory methods. Dr. Reinhold recently made a trip to Europe and installed similar methods in the German factory with great success. The reduced price of these productions is expected to stimulate trade very materially and users of aluminum solder are urged to send their orders in early.

The Backus & Leeser Company, 410 West 13th street, New York, make their initial announcement in this issue of THE METAL INDUSTRY inviting platers and polishers to send for quotations on dynamos, motors, polishing lathes, anodes, buffs, etc., as well as complete installations. This firm is composed of C. G. Backus and C. B. Leeser, both of whom were formerly connected with the Zucker & Levett & Loeb Company. Mr. Backus has had a life time of experience in the plating business and is an expert in this line, and platers and polishers who are in the market for supplies, will find that inquiries sent to this concern will receive the best of attention.

MELTING FURNACE PROGRESS

Kroeschell Brothers Company, Chicago, Ill., announce that the Kroeschell-Schwartz melting furnace has been having a splendid sale among the users of brass, bronze, aluminum and other non-ferrous metals. A prominent manufacturer, who does not care to have his name published, made some severe tests recently with this furnace, with the following results. He used a No. 1 tilting furnace, and the charge was 400 pounds of bronze. The time required for melting the 400 pounds was 78.3 minutes, and the oil consumed was 6.74 gallons, or 1.685 gallons of oil per 100 pounds of bronze melted. The loss of metal was from 2 to 2½ pounds in the 400 pounds.

The following are extracts from letters written by prominent firms, all eulogizing the Kroeschell furnace:

The Pittsburg Brass Manufacturing Company, Pittsburg, say: "The furnace fills the bill in every particular. We cheerfully recommend this furnace for brass foundry use, as the most economical and quickest-running furnace we know of at the present time."

The Andrew Messmer Company, Cincinnati, say: "After a thorough trial we find they are a great advantage over the coke furnaces we formerly used. Our coke bills averaged $40 per month, while the same amount of melting is done now with $14 worth of natural gas. At the same time they require less labor, produce no dirt or ashes, and do not burn out the metal as readily as the coke furnaces."

The Langsenkamp-Wheeler Bass Works, Indianapolis, Ind., say: "We have been operating these nine furnaces (one tilting and eight stationary) about four months with good success, and find it a great saver over the old way of melting. We are very well pleased with them, and they do all you claim." These are oil furnaces.

The Tallman Brass & Metal Company, Hamilton, Ont., say: "We find them very satisfactory and very economical in the use of gas." This firm has sent in six orders for eight furnaces.

The Burlington Brass Works, Burlington, Wis., say: "As this is our third order for your furnaces we have had ample opportunity to know and we believe you have the best furnace on the market today." They have five furnaces burning oil.

The Pioneer Brass Works, Indianapolis, Ind., say: "We have five of the No. 70 furnaces and one of the No. 100 furnace and find them satisfactory in every way. We are melting brass, bronzes and aluminum in these furnaces with a very low percentage of oxidation. We get from six to eight heats per day from each furnace." They have ordered four times for six furnaces.

The Engelburg Huller Company, Syracuse, N. Y., say: "We have been using these furnaces on pig iron and the product requires very hot metal, and has been giving very good results." Using oil.

Pictures of the furnaces are shown on another page in their advertisement.

CATALOGUE EXHIBIT

An exhibition of every kind of catalogues may be seen at THE METAL INDUSTRY office, 99 John street, New York. THE METAL INDUSTRY is prepared to do all of the work necessary for the making of catalogues, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

INFORMATION BUREAU

Any firm intending to buy metals, machinery or supplies, and desiring the names of the various manufacturers and sellers of these products can obtain the desired information by writing to THE METAL INDUSTRY. Commercial questions are answered by return mail. Our Information Bureau is for the purpose of answering questions of all kinds. Address THE METAL INDUSTRY, 99 John street, New York.

METAL MARKET REVIEW

NEW YORK, March 13, 1911.

COPPER.

The London market for Standard copper has been very dull and prices show very little change. Opening at £55 3s. 9d., and closing at £54 15s. Very little interest has been taken in the market and trading has been light.

In the New York market prices are about the same as a month ago, Lake at 12¾, Electrolytic 12½, and Casting brands at 12⅜.

The reports for the month were rather smaller, being only 18,992 tons, making total exports so far this year 48,349 tons against 51,937 tons for the same period last year.

In view of the heavy increase in the total visible of stocks of copper, as published by the Copper Producers' Association, the market has held remarkably steady; the point taken into account by consumers was the large decrease in production during the month of January, and with possibly no large increase in production likely in February, the market may be firmer all around.

PIG TIN.

The London market for pig tin has been very erratic and prices fluctuated violently, showing at times a difference of £30 between the highest and the lowest prices reached during the month. Opening at £196, prices reached £200, then the market broke rapidly to £171 5s., and closed at £193, showing a net decline for the month of £3 per ton.

The New York market has been simply following the fluctuations of the London speculators. The public cables gave the market as it existed, while private cables were supposed to give inside information that should be more or less reliable, but at the end of the day or the month the operator who had done nothing had generally made the most money. The trade today is totally in the dark as to whether the Syndicate has liquidated its holdings or whether it has let down prices to catch the unsuspecting bear, and on this basis it is a good market to leave alone.

Spot tin is quotable today at around 40 cents. March and April delivery can be bought at around 39 cents per pound.

The statistics for the month are favorable for the bulls, showing a total visible supply of 17,260 tons against a visible supply of 21,288 tons a year ago. The deliveries for the month of February were 3,800 tons; this is considered a very heavy consumption for a short month with two holidays.

LEAD.

The foreign lead market has advanced about 10s. per ton during the month.

The New York market has held very steady around 4.50 New York during the entire month. At the close the market is a little easier and the Trust price of 4.50 can generally be shaded. St. Louis market is dull and easier at 4¼.

SPELTER.

In the London market prices have declined about 10s. per ton, closing at £22 17s. 6d.

The New York market has held fairly steady and prices at the close show an advance of from 15 to 20 points and closes at 5.75, New York, for carload lots spot, and 5.65 to 5.70 for prompt Western shipment.

In St. Louis, market price is steady at 5.50 to 5.55.

ALUMINUM.

The market for aluminum holds very steady and prices are unchaged from last month. Round lots are quotable at from 21 to 21½, and future shipments can be booked at same rates. Small lots are quoted at 22 to 22½ for ingots 98-99 per cent. pure.

ANTIMONY.

The price of antimony in the London market has advanced from £30 in January to £35 today, due entirely to manipulation and the operation of a foreign combination.

In the New York market prices have been advanced about 1¼ cents per pound all around. At the close the market is dull and prices are quoted today at below the cost to import—Cookson's 9½; Hallett's, 9¼. Chinese is quoted at 8⅞ and Hungarian grade at 8⅞ to 9 cents.

SILVER.

The fluctuation in the silver market have not been very violent, opening at 52¾ cents, prices reached 53, the highest and 51⅜ the lowest, closing at 52⅝. In the London market prices opened at 24⅛d., and closed at 24¼d.

QUICKSILVER.

The market has been very active and prices show an advance of $6.00 per flask in wholesale lots; the quotation today is $52.00 per flask, wholesale, and jobbing lots from $52.50 to $53.00.

PLATINUM.

The foreign market is very much stronger again, owing to the determination of the Russian government not to export any more crude platinum and this has naturally affected all the markets. Prices today are $43.00 for the hard, and $41.00 for the ordinary refined, for round lots.

SHEET METALS.

Prices for wire and sheet copper are unchanged. Wire is quoted at 14 cents base, sheet copper from 16 to 18 cents base; brass and copper tubing unchanged; high sheet brass, 14¼; seamless copper tubing, 21 cents; seamless brass tubing, 18 cents.

OLD METALS.

Prices are possibly a shade easier than a month ago. The feature of the market has been the good foreign demand for all copper scrap. Consumers are more willing to come in than a month ago.

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)

		March 8, 1911.
Stocks of marketable copper of all kinds on hand at all points in the United States, February 1, 1911....		142,439,490
Production of marketable copper in the United States from all domestic and foreign sources during February, 1911.....		109,828,297
		252,267,787
Deliveries:		
For domestic consumption.....	50,518,998	
For export	45,111,019	
		95,630,017
Stocks of marketable copper of all kinds on hand at all points in the United States, March 1, 1911..		156,637,770
Stocks increased during the month of February....		14,198,280

FEBRUARY MOVEMENTS IN METALS

COPPER.	Highest.	Lowest.	Average.
Lake	12.75	12.70	12.75
Electrolytic	12.50	12.30	12.50
Casting	12.40	12.20	12.35
TIN	45.80	38.30	42.85
LEAD	4.50	4.50	4.50
SPELTER	5.75	5.60	5.70
ANTIMONY (Hallett's)	9.25	7.75	8.05
SILVER	.53	.51⅜	52.22

WATERBURY AVERAGE

The average price of lake copper per pound as determined monthly at Waterbury, Conn.

1910—Average for year 13.13½. 1911.—January, 12⅞; February, 12¾.

INQUIRIES AND OPPORTUNITIES

Under our directory of "Trade Wants" (published each month in the back advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds. See Want Ad. pages.

Metal Prices, March 13, 1911

NEW METALS.

	Price per lb. Cents.
COPPER—PIG, BAR AND INGOT AND OLD COPPER. Duty Free, Manufactured 2½c. per lb.	
Lake, carload lots	12.75
Electrolytic, carload lots	12.50
Casting, carload lots	12.40
TIN—Duty Free.	
Straits of Malacca, carload lots	40.00
LEAD—Duty Pigs, Bars and Old, 2½c. per lb.; pipe and sheets, 2⅜c. per lb.	
Pig lead, carload lots	4.50
SPELTER—Duty 1⅜c. per lb. Sheets, 1⅝c. per lb.	
Western carload lots	5.75
ALUMINUM—Duty Crude, 7c. per lb. Plates, sheets, bars and rods, 11c. per lb.	
Small lots	28.00
100 lb. lots	25.00
Ton lots	21.50
ANTIMONY—Duty 1½c. per lb.	
Cookson's, cask lots, nominal	9.50
Hallett's cask lots	9.25
Chinese	8.85
Hungarian grade	9.00
NICKEL—Duty Ingot, 6c. per lb. Sheet, strips and wire 35% ad valorem.	
Shot, Plaquettes, Ingots, Blocks, according to quantity	.43 to .60
MANGANESE METAL—Duty 20%	.90
MAGNESIUM METAL—Duty 3 cents per pound and 25% ad valorem (100 lb. lots)	1.50
BISMUTH—Duty free	2.10
CADMIUM—Duty free	.80
CHROMIUM METAL—Duty 25% ad val	.98
	Price per oz.
GOLD—Duty free	$20.67
SILVER—Duty free	.52¾
PLATINUM—Duty free	41.00
QUICKSILVER—Duty 7c. per lb. Price per pound .65 to	.67

OLD METALS.

Dealers' Buying Prices. Cents per lb.		Dealers' Selling Prices. Cents per lb.
10.75 to 11.00	Heavy Cut Copper	11.75 to 12.00
10.50 to 10.75	Copper Wire	11.50 to 11.75
9.75 to 10.00	Light Copper	10.75 to 11.00
9.25 to 9.50	Heavy Mach. Comp.	10.50 to 10.75
7.00 to 7.25	Heavy Brass	8.00 to 8.25
5.50 to 5.75	Light Brass	6.75 to 7.00
7.00 to 7.25	No. 1 Yellow Brass Turnings	8.00 to 8.25
8.00 to 8.25	No. 1 Comp. Turnings	9.00 to 9.25
3.90 to 4.00	Heavy Lead	—— to 4.25
3.75 to 3.90	Zinc Scrap	—— to 4.25
5.00 to 5.50	Scrap Aluminum, turnings	5.00 to 6.50
10.00 to 12.00	Scrap Aluminum, cast, alloyed	11.00 to 13.00
14.00 to 15.00	Scrap Aluminum, sheet (new)	16.00 to 17.50
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
25.00 to 27.00	Old Nickel	28.00 to 30.00

INGOT METALS.

	Price per lb. Cents.
Silicon Copper, 10% to 20%..according to quantity	28 to 35
Silicon Copper, 30% guaranteed " "	38
Phosphor Copper, 5% " "	19 to 21
Phosphor Copper, 10% to 15%, guaranteed " "	28 to 30
Manganese Copper, 30% " "	30 to 35
Phosphor Tin " "	34 to 36
Brass Ingot, Yellow " "	8½ to 9½
Brass Ingot, Red " "	11 to 12½
Bronze Ingot " "	10 to 11
Manganese Bronze " "	17 to 19
Phosphor Bronze " "	13 to 16
Casting Aluminum Alloys " "	29 to 35
PHOSPHORUS—Duty 18c. per lb. According to quantity	30 to 35

PRICES OF SHEET COPPER.

BASE PRICE, 18 Cents per Lb. Net.

PRICES MENTIONED BELOW ARE FOR QUANTITIES OF 100 LBS. AND OVER.

SIZE OF SHEETS.		64 oz. and over 50 lb. sheet 30 x 60 and heavier.	32 oz. to 64 oz. 25 to 50 lbs. sheet 30 x 60.	24 oz. to 32 oz. 18¾ to 25 lb. sheet 30 x 60.	16 oz. to 24 oz. 12½ to 18¾ lb. sheet 30 x 60.	14 oz. and 15 oz. 11 to 12½ lb. sheet 30 x 60.	12 oz. and 13 oz. 9½ to 11 lb. sheet 30 x 60.	10 oz. and 11 oz. 7¾ to 9½ lb. sheet 30 x 60.	8 oz. and 9 oz. 6¼ to 7¾ lb. sheet 30 x 60.	Lighter than 8 oz.
		Cents Per Pound Over Base Price for Soft Copper.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	1	2	3	6	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	3	6	9	
	Longer than 96 inches.	"	"	"	"	2	6			
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	"	"	2	4	7	10	
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	2	6	9		
	Longer than 96 inches. Not longer than 120 inches.	"	"	"	1	3				
	Longer than 120 inches.	"	"	1	2					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	"	1	2	4	7	10		
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	5	8			
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	8				
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	6	11			
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	9				
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins.	Not longer than 132 inches.	4	6							
	Longer than 132 inches.	5	8							

The longest dimension in any sheet shall be considered at its length.

CIRCLES, SEGMENTS AND PATTERN SHEETS, advance over prices of Sheet Copper required to cut them from 3 cents per pound.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot, and heavier, add 1 " " "

COLD OR HARD ROLLED COPPER, lighter than 14 oz., per square foot, add 2 " " "

POLISHED COPPER, 20 INCHES WIDE and under, advance over price for Cold Rolled Copper of corresponding dimensions and thickness 1 " " sq. ft.

POLISHED COPPER, WIDER THAN 20 INCHES, advance over price for Cold Rolled Copper of corresponding dimensions and thickness 2 " " " "

COLD ROLLED COPPER, PREPARED SUITABLE FOR POLISHING, same as Polished Copper of corresponding dimensions and thickness.

COLD ROLLED AND ANNEALED COPPER SHEETS OR CIRCLES, same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

ROUND COPPER ROD, ⅜ inch diameter or over.....Base Price.

(Rectangular, Square and Irregular Shapes, Copper Rod, Special Prices.)

	Cents per lb.
ZINC—Duty, sheet, 1⅝c. per lb.	
Carload lots, standard sizes and gauges, at mill	7.50 less 8%
Casks	8.00
Open casks	8.50

Metal Prices, March 13, 1911

PRICES ON BRASS MATERIAL—MILL SHIPMENTS,

In effect Jan. 30, 1911, and until further notice.

To customers who purchase less than 40,000 lbs. per year and over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.13¼	$0.14⅞	$0.15⅝
Wire	.13¼	.14⅞	.15⅝
Rod	.13¼	.15⅜	.16⅜
Brazed tubing	.18⅜	—	.20¼
Open seam tubing	.16⅜	—	.18¼
Angles and channels, plain	.16⅜	—	.18¼

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass...	½c.	per lb. net advance
" —Best spring, drawing and spinning brass....	1½c.	" " " "
Wire —Extra spring and brazing wire.....	½c.	" " " "
" —Best spring and brazing wire.....	1c.	" " " "

To customers who purchase less than 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.14¼	$0.15⅞	$0.17⅞
Wire	.14¼	.15⅞	.18⅜
Rod	.14¼	.16⅜	.19⅜
Brazed tubing	.19⅜	—	.21½
Open seam tubing	.17⅜	—	.19½
Angles and channels, plain	.17⅜	—	.19½

5% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass...	½c.	per lb. net advance
" —Best spring, drawing and spinning brass....	1½c.	" " " "
Wire —Extra spring and brazing wire.....	½c.	" " " "
" —Best spring and brazing wire.....	1c.	" " " "

BARE COPPER WIRE—CARLOAD LOTS.

14c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	18½c. per lb. base
100 lbs. to 300 lbs. in one order	19c. " " "
Less than 100 lbs. in one order	20½c. " " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ in O. D. Nos. 4 to 13 Stubs' Gauge, 18c. per lb.
Seamless Copper Tubing, 21c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	26	25	20	19	18	18	18	18	18	18	18	19	20	22	24	25

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1⅛ inch	22	24
1¼ inch	25	27
1½ inch	32	35
1¾ inch	45	48
2 inch	56	60

Discount 55 and 5%.

PRICES FOR MUNTZ'S METAL AND TOBIN BRONZE.

Muntz's or Yellow Metal Sheathing (14" x 48")	14c.	net base
" " " Rectangular sheets other than Sheathing	16c.	" "
" " " Rod	14c.	" "
Tobin Bronze Rod	16c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 22¼c. net.
German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.
Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 23 B. S. Gauge, 2c. above price of pig tin in same quantity.
Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

	Wider than.....	3in.	6in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.
	and including....	12in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.	40in.
		in coils.								
No.	13 and heavier.....	34	34	36	36	36	36	39	39	39
"	14.....	34	34	36	36	36	36	39	39	39
"	15.....	34	34	36	36	36	36	39	39	39
"	16.....	34	34	36	36	36	36	39	39	39
"	17.....	34	34	36	36	36	36	39	39	39
"	18.....	34	34	36	36	36	36	39	39	42
"	19.....	34	34	36	36	36	36	39	40	43
"	20.....	34	36	36	36	36	38	41	42	44
"	21.....	34	38	38	38	38	40	43	44	50
"	22.....	34	38	38	38	40	40	43	47	51
"	23.....	34	38	38	38	40	40	43	49	52
"	24.....	34	38	40	42	42	42	45	51	54
"	25.....	36	39	41	43	43	43	46	53	57
"	26.....	36	39	42	46	46	46	51	55	61
"	27.....	36	40	44	48	48	49	54	58	64
"	28.....	36	40	46	48	49	49	56	62	67
"	29.....	38	41	48	50	52	52	61	67	72
"	30.....	38	42	50	52	56	62	69	72	77
"	31.....	43	47	55	58	63	71	74	77	83
"	32.....	45	49	57	61	69	77	91	90	95
"	33.....	47	51	60	65	73	84	91	100	110
"	34.....	50	55	62	70	78	91	103	110	120
"	35.....	..	65	70	80	90	100	115	125	..
"	36.....	..	80	90	100	115	120	135	..	..
"	37.....	..	104	114	129	144	159	174	..	..
"	38.....	..	124	139	154	169	184	204	..	..
"	39.....	..	144	164	184	204	224	..	..	..
"	40.....	..	174	204	224	244	..	..	..	..

In flat rolled sheets the above prices refer to lengths between 2 and 3 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are 100 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 25 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	27	24	..	..	14	20	10	9	16	23
12.	.109.	..	..	..	..	..	..	..	26	..	..	..	15	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	17	..	..	..	..	..
16.	.065.	..	..	..	..	..	28	27	27	24	23	21	21	21	21	27	31	57
18.	.049.	..	..	..	..	33	30	29	28	25	26	26	26	..	..	..	..	..
20.	.035.	117	..	46	39	34	33	32	30	29	30	30	30	31	38	49	58	81
21.	.032.	..	..	..	40	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	138	98	48	42	38	37	35	34	..	..	45	..	..	..	..	..	..
24.	.022.	188	133	108	88	79	73	62	60	66	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter. B. & S. G'ge.	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price, per lb....	32	32½	32½	33	33½	34	34½	35	36	37	38	43	46

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive. American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4	per cent.	to	No. 19, B. & S. Gauge,	inclusive		$0.60
6	"	"	19,	"	"	.70
9	"	"	19,	"	"	.85
12	"	"	19,	"	"	1.00
15	"	"	19,	"	"	1.15
16	"	"	19,	"	"	1.20
18	"	"	19,	"	"	1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.
For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 2c. below to 6c. above the price of bullion.
Rolled silver anodes .999 fine are quoted at 2c. to 3½c. above the price of bullion.

DIRECTORY

METAL ROLLING MILLS.

INGOT, PLATE, SHEET, ROD, WIRE, TUBE, METAL GOODS.

Hendricks Brothers

Manufacturers of

Sheet and Bar Copper

COPPER FIRE BOX PLATES
and STAYBOLTS
WIRE and BRAZIER'S RIVETS

Importers and Dealers in

INGOT COPPER, BLOCK TIN,
SPELTER, LEAD, ANTIMONY
BISMUTH, NICKEL, Etc.

49 Cliff Street New York

Established 1802 Cable Address "Scovill"

Scovill Mfg. Co.

WATERBURY, CONN.

THE LARGEST AND MOST FULLY EQUIPPED BRASS ROLLING MILLS AND METAL GOODS MANUFACTURING ESTABLISHMENT IN THE WORLD

Estimates for Specialties in Brass, German Silver and Aluminum furnished on application.

DEPOTS:

NEW YORK: 75 Spring St. BOSTON: 170 Summer St. CHICAGO: 210 Lake St.

Waterbury Brass Co.

General Offices, Mills and Factories
WATERBURY, CONN.

NEW YORK OFFICE, 99 JOHN STREET.
Providence (R. I.) Store, 131 Dorrance St.

Shipments Upon Receipt of Order from Large Stock of

SEAMLESS DRAWN BRASS AND COPPER TUBING

BRASS { SHEET ROD WIRE COPPER { SHEET ROD WIRE

GERMAN SILVER { SHEET ROD WIRE

At Waterbury

NON-CORROSIVE FINEST QUALITY

Copper and Yellow

(MUNTZ) METAL
NAVAL BRASS
NAVAL BRONZE
MANGANESE BRONZE
PLATES, SHEETS, BOLTS, BARS, RODS, NAILS, TACKS, ETC.

Taunton-New Bedford Copper Co.

NEW BEDFORD, MASS.

77 Water Street, New York 61 Batterymarch Street, Boston

C. G. Hussey & Co.

PITTSBURGH, PENNA.

Manufacturers of

COPPER

In Sheets, Plates, Rolls

ANODES

Tacks and Nails

METAL GOODS

MADE TO ORDER

from

Brass and Copper

SHEETS, RODS, WIRE AND TUBING

Manganese Aluminum, Phosphor Silicon and "Bridgeport".

BRONZE

Bridgeport Brass Co.

Manufacturers

BRIDGEPORT, CONN.

BRASS and COPPER
in Sheets and Rolls

SILVER PLATED METAL
(for Coach Lamps)

BRITANNIA METAL

B. & M. BABBITT METAL
for Bearings

LINING METAL
for Automobiling Bearings and Copper for Electrical Purposes

H. K. & F. S. Benson

GLEN RIDGE, N. J.

The Seymour Mfg. Co.

SEYMOUR, CONN.

German Silver

Brass, Copper and Bronze in Sheets, Wire, Rods and Tubes

COPPER AND NICKEL ANODES

Phosphor Bronze

A. H. Wells & Co.

WATERBURY, CONN.

Manufacturers of

SEAMLESS... **Tubing**

NICKEL SILVER, BRASS, COPPER, BRONZE AND PURE COPPER

TUBING FOR ELECTRICAL PURPOSES

Odd and Special Shapes, and Small Tubing a Specialty

—Also the—

BOURDON STEAM GAUGE SPRINGS

All Sizes from 8 to 36, B. & S. Gauge.

"RIVERSIDE"

GERMAN SILVER

PHOSPHOR BRONZE

Sheets, Rods, Wire, Ingots, Castings, Jewelers' Bars and Alloys.

The

Riverside Metal Co.

Riverside, Burlington Co., N. J.

MANHATTAN BRASS COMPANY

332 East 28th St., NEW YORK CITY

Manufacturers of

BRASS and BRONZE in Sheet, Rod Wire, Tube, Moulding, etc. METAL GOODS made to order from Brass, Bronze and Copper.

BUFFALO COPPER AND BRASS ROLLING MILL

Military Road and Hertel Avenue
BUFFALO, N. Y.

THIS SPACE FOR SALE

SEND FOR RATES

DIRECTORY

METAL ROLLING MILLS.

INGOT, PLATE, SHEET, ROD, WIRE, TUBE, METAL GOODS.

The Ansonia Brass and Copper Co.
99 JOHN ST., NEW YORK
Manufacturers of
BRASS and COPPER Sheets, Tubes Rods and Wire
Sole Manufacturers TOBIN BRONZE
(Trade-Mark Registered)

THE PILLING BRASS CO.
WATERBURY, CONN.
Manufacturers of
ROLLED BRASS, BRONZE, GERMAN SILVER AND COPPER IN THIN GAUGES. PLATERS' METAL.

PHENIX TUBE CO.
Manufacturers of
Brass and Bronze Iron Lined Tubes
Brazed Steel Tubes
Round and Square
Main Office and Mills: Brooklyn, N. Y. City Branch Offices: Chicago, San Francisco

SEAMLESS STEEL TUBING
From 4 in. Diameter to 1-64 in.
Finished Bright, Smooth and Accurate to 1-1000 Ins. Inside and Out
Tool Steel Tubing. Soft Steel Tubing. Also Small Brass, Copper and Aluminum Tubing.
ELLWOOD IVINS TUBE WORKS
Oak Lane Station, Philadelphia, Pa.

Wm. F. Renziehausen Co.
Rollers of Silver Anodes and Sterling Silver
ALSO DEALERS IN
FINE GOLD AND SILVER
43-47 Oliver St., Newark, N.J.
Long Distance Phone 3759 R.

Britannia Metal
CASTING, ROLLING and REFINING FOR THE TRADE
Standard Rolling Mills Inc.
363 Hudson Avenue
BROOKLYN, N. Y.
(*See advertisement, page 37*)

LINTON & CO.
95 Pine Street PROVIDENCE, R. I.
MANUFACTURERS OF
Gold Solder
SHEET OR WIRE
Silver Solder
SHEET OR WIRE
Sheet Brass Solder

Established 1859. Telephone connection.
JOHN TOOTHILL
BRITANNIA METAL. ANTIMONIAL LEAD. SHEET BLOCK TIN
CASTING, ROLLING AND REFINING.
85 Barclay Street, New York City
ROCHELLE PARK, N. J.

Rolled Fireless Sterling Silver
SILVER SOLDERS, ANODE SILVER and SILVER WIRE
For further information address
JOHN J. JACKSON CO.
91 MECHANIC ST. NEWARK, N. J.

THIS SPACE FOR SALE

SEND FOR RATES

During a Year This Card is Circulated 75,000 Times

A Card in this Directory Will Give You Desired Publicity

A Card Places Your Name and Product Before Every Branch of The Metal Industry

Everyone in Business Needs Publicity

The Metal Industry
99 John Street
New York

DIRECTORY

LEAD AND ZINC SMELTERS AND MANUFACTURERS

PIG LEAD, SPELTER, SHEET ZINC AND ROD, ACIDS

Matthiessen & Hegeler Zinc Co.
LA SALLE, ILLINOIS
SMELTERS of SPELTER
and Manufacturers of
SHEET ZINC and SULPHURIC ACID
Zincs for Leclanche Battery
Special Sizes of Zinc to order. Rolled Battery Plates. Selected Plates for Etchers' and Lithographers' use. Selected Sheets for Paper and Card Makers' use. Stove and Washboard Blanks.

Horsehead Spelter
THE ORIGINAL BRAND OF PURE SPELTER
Indispensable in the manufacture of
Cartridge Metal, German Silver, Fine Spun Work, Fine Castings, Superior Alloys, &c.
The New Jersey Zinc Co.
National City Bank Bldg.
55 Wall Street, New York

Illinois Zinc Company
Manufacturers of
SPELTER, SHEET ZINC, and SULPHURIC ACID
PERU, ILL.
W. FISHER
Agent, 81 and 83 Fulton Street
New York City
Telephone, 139 Beekman

This Space FOR SALE
Send for Rates

Sandoval Zinc Co.
Manufacturers of
HIGH GRADE SPELTER
SUITABLE FOR ALL PURPOSES
General Offices:
120 North Peoria Street
CHICAGO, ILLS.
Works: Sandoval, Ills.

Cold Rolled Zinc
IN COILS FOR DRAWING and STAMPING
The Platt Bros. & Co.
WATERBURY, CT.

THIS SPACE FOR SALE

High-Grade Spelter and Sulphuric Acid
HEGELER BROTHERS, DANVILLE, ILL.

A Card Places Your Name and Product Before Every Branch of The Metal Industry

THE METAL INDUSTRY DIRECTORIES

are a Ready Reference for Buyers and Sellers. They are classified cards better than the street signs of a business.

In no way can you get such good Trade Publicity at so slight a cost.

RATES FURNISHED FOR THE ASKING

THE METAL INDUSTRY, 99 John St., New York

DIRECTORY

METAL SMELTERS, REFINERS, DEALERS.
BUYERS AND SELLERS OF NEW AND OLD METALS

Illinois Smelting & Refining Co.

122 N. Peoria St., Chicago, Ill. Cable Address, "Smelref," Chicago

Manufacturers of

Pig and Bar Lead, Spelter, Babbitt Metals Linotype, Stereotype, Monotype and Electrotype Metal, Yellow Composition and Phosphor Ingots

Dealers in New and Old Metals, and the Largest Buyers of Zinc Dross, Skimmings, Sal Skimmings, Scrap Zinc and Aluminum

The Morton B. Smith Co.

241 and 243 Front Street, New York

OFFER FOR SALE:

HEAVY COPPER AND WIRE, Ready for the Crucible
COMPOSITION, Carefully Selected
HEAVY YELLOW BRASS, Free from Iron
OLD METALS GENERALLY

THEODORE HOFELLER & CO.

BUFFALO, N. Y.

Our Specialties

Heavy Copper and Copper Wire Cut in Crucible Shape

Number One Red Brass Scrap

Heavy Yellow Brass Scrap

SMELTERS OF

Skimmings, Grindings, Buffings, Sweepings } **BRASS** { Skimmings, Grindings, Buffings, Sweepings

WHITE & BRO., Inc.

Station K, Philadelphia, Pa.

Albert A. Moers

24 Stone Street, New York

..PIG TIN..

Write me to-day for attractive prices in large and small quantities. Only 98 per cent. and 99 per cent. handled. Can be used for all purposes. 250 tons per month.

"BLOW-HOLES"

are caused by the gases absorbed in the melting, and our Magnesium is the best Agent for the elimination of the said gases, thus removing the CAUSE of "blow-holes," and furnishing the means for production of First-Class Castings.

Always Specify "LEAVITT'S MAGNESIUM

C. W. LEAVITT & CO.

HUDSON TERMINAL - - NEW YORK

THIS SPACE FOR SALE

Send for Rates

Telephone, Bridge 1519 Lock Box 163

SANDOVAL ZINC CO.

Chemical Department

EAST ST. LOUIS, ILLS.

Manufacturers of Soldering Flux, Commercial Salts, and Chloride of Zinc in Fused, Granulated and Liquid form

The Granulated Chloride of Zinc is indispensable, as a flux, to Brass, Copper and Aluminum Founders

Put up in 50 and 100 lbs. iron packages

Price 10 cents per pound delivered in the United States

S. BIRKENSTEIN & SONS

379-407 W. Ontario Street, Chicago, Ill.

Lake, Electrolytic and Casting Ingot Copper

DIRECTORY

METAL SMELTERS, REFINERS, DEALERS
BUYERS AND SELLERS OF NEW AND OLD METALS.

M. M. ANDLER & CO.

Boston, Mass.

. . . Dealers in . . . **METALS**

Consumers of Skimmings, Grindings, Drosses, Filings and all kinds of Scrap Metals. Also Brass Foundry Ashes

Wm. F. Renziehausen Co.

Gold and Silver Refiners

Sweep Smelters, Assayers and Analytical Chemists

Full value paid for any material containing Gold, Silver and Platinum

43-47 Oliver Street - - Newark, N. J.

Long Distance Phone, 3759-R

BRASS INGOT

Whipple & Choate, Bridgeport, Conn.

To Buy and Sell Metals to the Best Advantage
Let People Know You are in Business

THE AMERICAN SMELTING AND REFINING COMPANY

CINCINNATI, OHIO

BABBITT
SOLDERS
TYPE METALS
BRASS INGOTS

METALS

INGOT COPPER
ALUMINUM
ZINC
LEAD TIN

Sole Manufacturers of KANSAS SELECT DOUBLE REFINED SPELTER (Best for Brass Foundries)

DIRECTORY

METAL FOUNDERS, FINISHERS AND WORKERS.

The Light Manufacturing and Foundry Company

Pottstown, Pa.

Are the Original and only Manufacturers of

AUTOMOBILE BRAND AERIAL BRAND
ALUMINUM CASTINGS

Our Aluminum Castings are especially adapted to Automobile, Auto Boat and Aerial Construction.

BRASS AND BRONZE ALUMINUM CASTINGS

Rough or Finished

We make a specialty of CONTRACT WORK of all kinds. Send Sample for Quotation.

AUGUST BUERMANN, Newark, N. J.

ESTABLISHED 1842.

DIRECTORY

METAL FOUNDERS, FINISHERS AND WORKERS.

DIRECTORY

METAL ETCHERS, PLATERS AND POLISHERS

PHONE 5308 LENOX

ETCHED NAME PLATES

SCALES, DIALS, ETC.

ETCHING OF ALL KINDS
ON ALL METALS

MANUFACTURERS OF METAL GOODS

ETCHED ADVERTISING NOVELTIES
CALENDERS, ETC., A SPECIALTY Artistically Designed.

ENGRAVED SIGNS, GENERAL ENGRAVING
STAMPING AND SAW PIERCING

ELECTRO GOLD, SILVER, COPPER AND NICKEL PLATING
Let us quote you prices. No order too small, no order too large.
If you have anything you want manufactured in metal, write, phone, or wire.

KRIZAN & HILL, Manufacturers, 521-523 E. 72nd St., New York City

---

NO JOB TOO LARGE OR TOO SMALL FOR US

Northern Ohio Manufacturing and Refinishing Works

B. HENGST, Prop.

GOLD, SILVER NICKEL **PLATING** BRONZE AND BRASS

SAFETY RAZORS A SPECIALTY

Repairing of all Kinds of Metal Goods, also Lamps and Chandeliers

2069 EAST 4th STREET CLEVELAND, OHIO

MAX SCHWEIZER

230 North Ave.
BRIDGEPORT, CONN.

PRACTICAL ETCHER

— on —

Silverware, Knives, Scissors, Hardware, Signs, Clock Dials, Name and Embossing Plates, &c.

If You are An
Etcher, Plater or Polisher
Why Not
Let It Be Known

Metal Polishing and Electro Plating

We Cast and Finish Anything in Metal

AMERICAN TOY & NOVELTY MFG. CO.
214 W. INDIANA STREET CHICAGO, ILL.

THIS SPACE FOR SALE

SEND FOR RATES

BOOKS ON MACHINERY
BOOKS ON METALS
BOOKS ON PLATING
ARTICLES ON ALL RELATED SUBJECTS

See Page 52

THE METAL INDUSTRY, - 99 John Street, NEW YORK

DIRECTORY

PROFESSIONAL MEN AND EXPERTS

TRADE WANTS

AN EXCHANGE FOR THE WANTS OF THE METAL TRADES

Advertisements will be inserted under this head at 40 cents per line, 3 lines one dollar, for each insertion, excepting Situations Wanted, which are 50 cents each insertion. Answers sent in our care will be forwarded

FOR SALE

METALS, MACHINERY AND SUPPLIES

FOR SALE.

The exclusive rights to manufacture and sell a patented machine that greatly reduces foundry costs. This is an established business; the machines are in use in a number of prominent foundries, and there is an excellent opportunity for extension. Address B. R., care "The Metal Industry."

FOR SALE

Ingot Brass : Spelter : Pig Lead

M. I. WALSH'S SONS & CO., NEWARK, N. J.

Old Material of all Kinds Purchased

FOR SALE—BRASS SCRATCH BRUSHES, 4-row; diameter 5½ to 6 ins.; slightly used; $4 per dozen; cash to accompany order. Sample sent for 50c. in stamps. Cost of new ones $15 per dozen. THE VAN BERGH SILVER PLATE CO., Rochester, N. Y.

WE HAVE A STOCK of ¾-in. Iron Lined Brazed Brass Tube in 46-in. lengths, and 760 lbs. ½-in. No. 20 Annealed Brass Tube in 6 ft. 6 in. lengths; also assortment of No. 18 Gauge Brass Tube from ¾ in. to 2 in. Want to sell, and invite correspondence. THE ADAMS & WESTLAKE COMPANY, CHICAGO, ILL.

FOR SALE—One 32-inch 300-lb. capacity SCHWARTZ FURNACE in A-1 condition. Address PENBERTHY INJECTOR COMPANY, Detroit, Mich.

FOR SALE—MOLDING MACHINES, second-hand, in good condition. 1 Mumford air molding machine for 12 x 14-in. flask; air power to squeeze; air power to draw patterns with 5-in. lift. 1 Mumford air squeeze with 26 x 18-in. table on same. Address SPEAKMAN SUPPLY AND PIPE CO., Wilmington, Del.

J. P. FANNING, machinist, 678 Jefferson avenue, Brooklyn, N. Y.—Maker of Moulds for Casting Solder, Babbitt Metal, Bar Lead, etc. We also manufacture small work. Write for particulars.

FOR SALE—Complete file, New Series, METAL INDUSTRY to date. Make offer. SHEPARD, 77 E. 3rd So., Salt Lake City, Utah.

PLANTS

FOR SALE—Small METAL MELTING PLANT adapted for experimental work on ALLOYS of COPPER, NICKEL, etc. Absolute privacy. Maximum furnace capacity, 35 crucible. Location, Jersey City, N. J. Monthly rent, $4. Make offer. Address JERSEY CITY, care THE METAL INDUSTRY.

FOR SALE OR LEASE—BRASS AND ALUMINUM FOUNDRY in Indianapolis, Ind. Thoroughly modern in equipment and appliances. Did a business in its last year of nearly $200,000.00. Second largest automobile center in United States. Nearly thirty auto factories in city and vicinity. Great quantities of brass and aluminum castings required here and within a radius of one hundred miles. Present owner engaged in other business requiring his time. Address F. E. JANES, care F. E. JANES COAL & GRAIN COMPANY, INDIANAPOLIS, IND.

FOR SALE.—BRASS FOUNDRY in Brooklyn, N. Y., fully equipped and running at the present time. Good line of paying business. Owner engaged in other business requiring his time. Address J. W. C., care THE METAL INDUSTRY.

FOR SALE—PLATING and POLISHING SHOP, the only one in city. At the present time doing good business. Reason for selling, other business. Cheap to quick buyer. Address PLATING SHOP, care THE METAL INDUSTRY.

FOR SALE—A fully equipped ELECTRO-PLATING PLANT in large western city. Established four years. Profits from $175 to $200 per month. Price $2,000 if taken at once. Terms $1,200 down, balance to suit buyer. Reason for selling, death of owner. Address H. B. B., care THE METAL INDUSTRY.

FOR SALE—ELECTRO-PLATING PLANT doing a good business in the heart of the city of Boston. Good reasons for selling. WINTHROP PLATING COMPANY, 34 Beach street, Boston, Mass.

FOR SALE—Good paying BRASS MANUFACTURING ORNAMENTAL METAL and PLATING WORKS; fully equipped; long lease; cheap rent; established thirty years; wants to sell on account of sickness; will sacrifice for $9,000, at least half cash. Address BOX 1, care THE METAL INDUSTRY.

WANTED

METALS, MACHINERY AND SUPPLIES

WANTED—A 10 h. p. UPRIGHT BOILER. Must be in good condition and at low cost. Address S-1, care THE METAL INDUSTRY.

WANTED—Second-hand 6 or 8 h. p. horizontal engine and boiler. State what make, condition and price. Address HORIZONTAL, care THE METAL INDUSTRY.

BUSINESS OPPORTUNITIES

I HAVE UP-TO-DATE FACTORY BUILDINGS covering about 30,000 square feet of ground, railroad siding, modern economical power, electric lighting and steam heating plants, all situated on a portion of my four acres of ground which has CITY ADVANTAGES and COUNTY TAXES. The location is an Eastern seaport town. The factory is equipped with modern brass-finishing machinery, nickel-plating plant, etc. As I am about to establish a Plumbers' Brass Goods Manufactory, I desire a partner who understands the plumbers' brass goods manufacturing business in all its branches who can contribute $25,000 (more or less) in cash. Besides the above-mentioned factory buildings, land, machinery, etc., I shall contribute $25,000 in cash, thus giving the association $50,000 cash working capital. Non-union brass working labor, in all its branches, is plentiful in our city at wages about 15 per cent. less than in similar large cities in the United States. Applicant please reply with full particulars, stating past experience. Do not answer unless you mean business. All correspondence strictly confidential, and will be returned if desired. Address M-8, care THE METAL INDUSTRY.

I WOULD LIKE TO GET IN TOUCH with some established manufacturer of plumbers' and steamfitters' goods who is in need of some person with experience and capital who would take active interest. Send full particulars to M-10, care THE METAL INDUSTRY.

HAVE ALL METAL flying machine and full line of aeronautical supplies. All will be covered by patent rights. Association with interested party or concern who will finance desired. J. FILLMORE COX, Con. & P. Mechanical Engineer, Bayonne, N. J.

INQUIRIES

Inquiries received by THE METAL INDUSTRY for Metals, Machinery and Supplies. Further particulars may be obtained by addressing the inquiry number, care THE METAL INDUSTRY. No charge for inserting these inquiries.

Inquiry No. 271—We would like to correspond with the manufacturers of stoneware dipping baskets in various shapes.

Inquiry No. 272—We would like to correspond with firms making plants for enameling copper wire similar to the enameled magnet wire on the market today.

Inquiry No. 273—We would like to correspond with the maker of aluminum-steel castings.

Inquiry No. 274—We would like to correspond with the manufacturers of pipe bending machines for the purpose of bending light gauge brass tubing up to 2 in. diameter without first filling the tube with lead, rosin or similar filling material.

Inquiry No. 275—We would like to correspond with the manufacturer of brass foundry flux called "Iron Fiend."

Inquiry No. 276—We would like to correspond with firms who make small brass novelties decorated with enamel, such as class pins, campaign buttons, cheap jewelry, etc.

Inquiry No. 277—We would like to correspond with firms relative to the "Sherardizing Process." Send particulars of machinery, etc.

Inquiry No. 278—I would like to correspond with firms who can furnish a good black bright lacquer for applying with a brush.

Inquiry No. 279—We would like to correspond with firms making a substitute for benzine used for washing brass work after it is polished and before lacquering.

Inquiry No. 280—We would like to correspond with firms that do etching on brass.

Inquiry No. 281—We would like to correspond with firms making dipping metals of the following formula or some other metal as good: Pure black tin, 10 lbs.; metallic bismuth, 4 oz.; antimony, 2 oz.

Inquiry No. 282—We would like to correspond with firms making small enameled metal designs, such as fancy name plates of small size, made from blue or gold enamel, or white and silver, or any such designs.

Inquiry No. 283—Would like to correspond with manufacturers of die casting machines.

Inquiry No. 284—Would like to have catalogues and full particulars of small melting furnaces.

Inquiry No. 285—Would like information about electric welding machines.

TRADE WANTS

AN EXCHANGE FOR THE WANTS OF THE METAL TRADES

Advertisements will be inserted under this head at 40 cents per line, 3 lines one dollar, for each insertion, excepting Situations Wanted, which are 50 cents each insertion. Answers sent in our care will be forwarded

SITUATIONS OPEN

EXECUTIVE

WANTED—Young man about 25-30 years old to take charge of QUOTATION DEPARTMENT in office of MANUFACTURER of PLUMBERS' BRASS GOODS. Familiarity with costs is absolutely necessary. Give full particulars regarding experience, references, salary, etc. Replies treated confidentially. Address PLUMBERS' BRASS, care THE METAL INDUSTRY.

SALESMEN

WANTED—MIXED METAL SALESMAN. Must know solder and babbitt trade. Good opportunity for man who can make good. Answers strictly confidential. Address B-L, care THE METAL INDUSTRY.

WANTED—An experienced SALESMAN with an established trade to sell several well-known grades of BABBITT METALS; territory unlimited. Address M-7, care THE METAL INDUSTRY.

FOUNDERS

WANTED—A good MOLDER for light YELLOW BRASS. We pay prevailing wages and can give a man steady employment. Location, Los Angeles, Cal. Address YELLOW BRASS, care THE METAL INDUSTRY.

WANTED—BRASS FOUNDRY WORKING FOREMAN, by concern making PLUMBERS' BRASS GOODS and HARDWARE, highest grade. Must understand melting and core making. State experience and salary. Location near Philadelphia. Address S. S. P., care THE METAL INDUSTRY.

DIE CASTER

WANTED—A MANAGING SUPERINTENDENT capable of taking complete charge of a DIE CASTING PLANT in CANADA, preferably one who can become interested financially and act as director. Address CANADA MANAGER, care THE METAL INDUSTRY.

MACHINIST

WANTED—Machinist wanted of first-class ability; man with rolling mill experience preferred. Address MACHINIST, care THE METAL INDUSTRY.

SHEET METAL WORKER

WANTED—FOREMAN for SHEET METAL DEPARTMENT. Well established automobile concern; for making fenders, tanks, radiators, etc. Excellent opportunity for first-class man. Address D-2, care THE METAL INDUSTRY.

PLATERS AND POLISHERS

WANTED—PLATER, competent to take charge of plating department. Must be up to date on all SILVER and GOLD SOLUTIONS, understand how to get all up-to-date finishes, and turn out clean work on German silver, toilet sets and cheap jewelry. Address M-6, care THE METAL INDUSTRY.

WANTED—First class PLATER and POLISHER to take entire charge of job-shop in city near New York. Business ability essential. Address, stating your experience and salary expected. Address RESULTS, care THE METAL INDUSTRY.

WANTED—COLORER; man thoroughly experienced in handling BELT BUCKLES and similar novelties. Must be capable of taking entire charge of room. Address, with full particulars, K. G., care THE METAL INDUSTRY.

WANTED—A PRACTICAL PLATER who thoroughly understands SILVER DEPOSIT business in all its branches. First-class opening for a competent man. With answers give full particulars, references, wages expected. Address D-3, care THE METAL INDUSTRY.

SITUATIONS WANTED

Advertisements Under This Heading 50 Cents Each Insertion.

EXECUTIVE

SITUATION WANTED—As EXECUTIVE, ORGANIZER, COSTS and BUYING EXPERT. Several years with one of the largest hardware manufacturers in the world. Educated at Yale University, 31 years old. Has personal acquaintance with a large proportion of the Eastern trade, particularly along practical lines. For full particulars address F-9, care THE METAL INDUSTRY.

SITUATION WANTED—As SUPERINTENDENT or GENERAL FOREMAN in a brass manufacturing establishment. Automobile, steam, and the general line of brass goods. Able to obtain results. Twenty years' experience. Address GENERAL FOREMAN, care THE METAL INDUSTRY.

SITUATIONS WANTED—Continued

EXECUTIVE—Cont'd

SITUATION WANTED—As MANAGER or SUPERINTENDENT. Energetic, aggressive, experienced in manufacture of PLUMBERS' BRASS work, valves, etc. Can handle help and get the work out. Modern methods, interchangeable parts, technical education. Address S-6, care THE METAL INDUSTRY.

SITUATION WANTED—BRASS FOUNDRY SUPERINTENDENT or FOREMAN. Thoroughly experienced on ALUMINUM CASTINGS for automobiles, valve, pump and general jobbing lines. Thirty-two years old, temperate and a hustler. Well up on molding machines and mixing metals. Address 0-2, care THE METAL INDUSTRY.

SITUATION WANTED—Position as MANAGER or SUPERINTENDENT with concern manufacturing BRASS GOODS. Technical graduate, married, sober, industrious and energetic, 30 years old, experienced on PLUMBERS' BRASS GOODS, BUILDERS' HARDWARE, etc.; INTERCHANGEABLE PARTS, modern methods, executive, cost accountant. References. Address R., care THE METAL INDUSTRY.

SITUATION WANTED—By a BRASS WORKS MANAGER, in the Middle West preferred. Thoroughly understands the manufacture of BRASS and METAL GOODS and desires to connect with some manufacturing business, having capital to invest if the right business is secured. Address MANAGER, care THE METAL INDUSTRY.

PROFESSIONAL

SITUATION WANTED—By a CHEMIST and ASSAYER. Have had three years' experience and am at the present time employed as Assistant Chemist and Assayer to one of the largest jewelry manufacturrs in New York. Expert on precious metals and some experience on the baser metals. For full particulars, address B. J. W., care THE METAL INDUSTRY.

SITUATION WANTED—A METALLURGICAL CHEMIST of ten years' practical FOUNDRY and ANALYTICAL experience desires a position with a large manufacturing concern where such foundry and laboratory experience would be appreciated. Address HYDRAULIC BRONZE, care THE METAL INDUSTRY.

SITUATION WANTED—CHEMIST, 8 years with U. S. GOVERNMENT. Thoroughly experienced in the analysis of non-ferrous alloys, metallurgical products. Desire to make a change and would like to correspond with an established concern. Can furnish excellent references. Moderate salary. Address J. J. B., care THE METAL INDUSTRY.

SITUATION WANTED—ELECTRICIAN, experienced at installing and maintenance of motors and generators, light and systems. Also experienced plater. Address W. V., care THE METAL INDUSTRY.

SITUATION WANTED—As CHEMIST. A technical graduate with five years' practical experience in metallurgical laboratories. Can furnish references upon request. Address N-4, care THE METAL INDUSTRY.

SITUATION WANTED—METALLURGICAL ENGINEER. Graduate of Columbia University, two years' practice. Best of references. Address N-5, care THE METAL INDUSTRY.

SALESMAN

SITUATION WANTED—SALESMAN to represent manufacturer in Chicago and Middle West. Especially successful in selling specialties. Have well equipped office, acquaintanceship among hardware, stationery and department store buyers. Can furnish references. Address SAVAGE, 56 Fifth avenue, Chicago, Ill.

SITUATION WANTED—By a German with ten years' experience as office salesman in Germany in the BRASS and COPPER business. Willing to start with moderate salary. Address GERMAN, care THE METAL INDUSTRY.

TUBE MAKER

SITUATION WANTED—By SEAMLESS TUBE expert thoroughly understanding the manufacture of seamless tubes. Concern making small sizes preferred. Address F-5, care THE METAL INDUSTRY.

PATTERN MAKER

SITUATION WANTED—By a MODELLER and PATTERN MAKER in the Brass trade. Have had 25 years' experience in gas, electric, water and steam fittings, cabinet, brass foundry and bedstead manufacture. For four successive years have held a position as teacher in classes arranged for BRASS WORKERS in all departments, for practical and theoretical instruction. For full particulars of my ability, etc., address F-10, care THE METAL INDUSTRY.

SITUATION WANTED—FOREMAN METAL PATTERN MAKER experienced on steam specialties and plumbers' brass goods, also the manufacture of general brass goods. Address B, care THE METAL INDUSTRY.

TRADE WANTS

AN EXCHANGE FOR THE WANTS OF THE METAL TRADES

Advertisements will be inserted under this head at 40 cents per line, 3 lines one dollar, for each insertion, excepting Situations Wanted, which are 50 cents each insertion. Answers sent in our care will be forwarded

SITUATIONS WANTED—Continued

FOUNDERS

SITUATION WANTED—BRASS and BRONZE WORKER with many years' experience on church work, railing, architectural work, German silver work, hard soldering and all details for the BRASS and BRONZE trade. For good wages and steady position I am willing to go to any part of the United States. Address 100, care THE METAL INDUSTRY.

SITUATION WANTED—FOREMAN BRASS FINISHER, thoroughly familiar with the latest methods of manufacturing steamfitters' and plumbers' supplies, also specialty and jobbing; 18 years' experience. Best references. Address M-1, care THE METAL INDUSTRY.

SITUATION WANTED—By a BRASS MOLDER, 36 years old, experienced in jobbing and chandelier work. Able to take charge if required. Vicinity of New York preferred. Address P. P., care THE METAL INDUSTRY.

SITUATION WANTED—BRASS FOUNDRY SUPERINTENDENT or FOREMAN thoroughly experienced on ALUMINUM and BRASS CASTINGS, understanding mixing metal and molding machines, being a floor and bench molder. Can handle coal, coke, gas or oil furnaces. Can furnish best of references. Address F-4, care THE METAL INDUSTRY.

SITUATION WANTED—As FOREMAN in BRASS FOUNDRY. Capable of producing high-grade castings. Address A. B., care THE METAL INDUSTRY.

SITUATION WANTED—By a PLASTER COMPOSITION FOUNDRYMAN with 9 years' experience at fine arts castings in metals, plaster, wax and glue; also for patterns for engraving machines. Address P. C. F., care THE METAL INDUSTRY.

SITUATION WANTED—FRENCH SAND MOLDER wishes a position in foundry. Experienced on ornamental and architectural bronze, statuary, gold and silver castings. Estimates given on all kinds of work. Address FRENCH SAND MOLDER, care THE METAL INDUSTRY.

SHEET METAL WORKER

SITUATION WANTED—By FOREMAN SHEET METAL WORKER. Good all round man on brazing, silver soldering, hammering. Does own turning. Address F-1, care THE METAL INDUSTRY.

CHASER

SITUATION WANTED—By CHASER for ornamental and statuary work; 4 years' experience at Paris. Address F. C., care THE METAL INDUSTRY.

ETCHER

SITUATION WANTED—Thoroughly practical transfer etcher on silver, brass, copper and organic substances, desires to make a change. Good recommendations. Address X. T., care THE METAL INDUSTRY.

PLATERS AND POLISHERS

ELECTROPLATERS

Any one desiring the services of first class men for the electro-deposition of metals and finishing in all branches and departments of the plating business can secure such services by corresponding with the Secretary of the National Electro-Platers' Association, George B. Hogaboom, 656 Hunterdon Street, Newark, N. J.

SITUATION WANTED—Position as ELECTRO-GILDER and PLATER. Expert worker in jobbing, gilding and plating. Address JOB GILDER, care THE METAL INDUSTRY.

SITUATION WANTED—In Middle West or West, by a FOREMAN PLATER and POLISHER. Up-to-date in all branches of the business. Would like to take charge on contract or percentage basis rather than salary. Nineteen years' experience; 8 years as foreman. Address M-2, care THE METAL INDUSTRY.

SITUATION WANTED—By a FOREMAN PLATER, up-to-date on all new finishes and old colors. Can do anything in plating. Employed at present but would like to change. Experience on chandelier, lamps, hotel work, job work. Address M-3, care THE METAL INDUSTRY.

SITUATION WANTED—PLATER, POLISHER and LACQUERER wants to change. First-class man, best of references. Total abstainer, and can handle men to advantage. Address M-4, care THE METAL INDUSTRY.

SITUATIONS WANTED—Continued

PLATERS AND POLISHERS—Cont'd

SITUATION WANTED—PLATER, BUFFER and POLISHER wants position in New York City or vicinity. Had 20 years' experience, including a job shop of my own. Plate in copper, brass, nickel, bronze, silver, gold, platinum, zinc and tin. Make all chandelier, hardware and art metal finishes. A place starting their own plating preferred. Can install economic and efficient system. BOX 238, TOLEDO, OHIO.

SITUATION WANTED—By a PLATER 35 years of age, with five years' experience on CHANDELIER work and six years in a jobbing shop. Can furnish good references. Address M-5, care THE METAL INDUSTRY.

SITUATION WANTED—By a first-class FOREMAN PLATER. Have had charge of plants for the last 20 years and can produce any finish. Prefer position somewhere on the Pacific Coast. Address J. N. M., care THE METAL INDUSTRY.

SITUATION WANTED—By FOREMAN PLATER, up to date in all branches desires a position with a good firm located in New York or vicinity. Eighteen years' experience on JEWELRY, BUCKLES and NOVELTIES. Will accept no salary if not satisfactory. Best of reference. Address F-6, care THE METAL INDUSTRY.

SITUATION WANTED—FOREMAN PLATER and POLISHER or SUPERINTENDENT, executive ability, would like a position with a reliable firm. Can handle help to good advantage. Wages moderate. Address EXPERT PLATER, 45 LAWRENCE STREET, SOMERVILLE, MASS.

SITUATION WANTED—By a competent FOREMAN POLISHER with seventeen years' experience on all kinds of work. Can be depended upon to produce satisfactory results in the management of men and work. Can furnish the best of reference. If contemplating installing a polishing plant, write me. For further particulars address F-3, care THE METAL INDUSTRY.

SITUATION WANTED—By an experienced PLATER who desires a steady position. Capable of taking charge of POLISHING and BUFFING DEPARTMENTS. Position in Greater New York preferred. Address S. S., care THE METAL INDUSTRY.

SITUATION WANTED—By a GILDER EXPERT on shades of GOLD COLORING. Age 35. Position in Newark or New York City preferred. Address JEWELRY, care THE METAL INDUSTRY.

SITUATION WANTED—By a PLATER. First-class man on nickel, brass, copper, silver, black nickel; understands all hardware finishes, etc. Address N-2, care THE METAL INDUSTRY.

SITUATION WANTED—By FOREMAN of POLISHER, LACQUERER and BUFFER. Have had charge of 30 men for five years on bedstead trimmings. Also had charge of buffing room in a lamp factory and a chandelier factory. For further particulars of my experience, address L. J. A., care THE METAL INDUSTRY.

SITUATION WANTED—PLATER and ELECTRO-CHEMIST with a wide experience in the plating and coloring of art goods, jewelry and novelties. Address V. W., care THE METAL INDUSTRY.

SITUATION WANTED—A FIRST-CLASS PLATER who desires a position as foreman. Has had 22 years' experience in polishing, plating and buffing. Address BOX 188, care THE METAL INDUSTRY.

SITUATION WANTED—By a FOREMAN PLATER who is up to date on all finishes and colors. Desires a position with a good firm. Salary $30 per week. Address D-1, care THE METAL INDUSTRY.

SITUATION WANTED—By a first-class ELECTRO PLATER with 20 years' experience on all classes of work, 14 years as foreman plater for large concerns. Expert on all solutions, dips and finishes. Can get any finish on novelties, silverware and hardware. Can furnish best of references and would like to hear from first-class firms. Address EXPERT, care THE METAL INDUSTRY.

SITUATION WANTED—By an ELECTRO-PLATER, 18 years' experience with Nickel, Copper, Brass and Bronze solutions and oxidizing. Can furnish good reference. Address BOX M-9, care THE METAL INDUSTRY.

SITUATION WANTED—By a FOREMAN-PLATER who thoroughly understands the plating business from A to Z. Has had several years' experience and is capable of taking charge. Address P. H., care THE METAL INDUSTRY.

CLASSIFIED INDEX OF ADVERTISEMENTS AND BUYERS' GUIDE

Acid, Hydrofluoric (See also Platers' Supplies).
General Chemical Co., Philadelphia, Pa.
Kalbfleisch, Franklin H., Co., New York.
McKesson & Robbins, New York.

Acid, Muriatic (See also Platers' Supplies).
Grasselli Chemical Co., Cleveland, O.
Niagara Alkali Co., Niagara Falls, N. Y.

Acid, Sulphuric (See also Platers' Supplies).
Grasselli Chemical Co., Cleveland, O.
Illinois Zinc Co., Peru, Ill.
Kalbfleisch, Franklin H., Co., New York.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.
McKesson & Robbins, New York.

Air Compressors.
Eclipse Air Brush & Compressor Co., Bloomfield, N. J.
Eureka Pneumatic Spray Co., New York.
Lederer, F. J., Co., Buffalo, N. Y.
Nicholls, W. H., New York.
Otto Gas Engine Co., The, Philadelphia, Pa.
Pangborn, Thomas W., Company, New York.

Air Filters.
Eclipse Air Brush & Compressor Co., Bloomfield, N. J.
Eureka Pneumatic Spray Co., New York.

Alloys Made to Specifications.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
American Manganese Bronze Co., New York.
Birkenstein, S., & Sons, Chicago, Ill.
Clum & Atkinson, Rochester, N. Y.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Genessee Metal Co., Rochester, N. Y.
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Aluminum Bronze Ingots.
Electric Smelting & Alum'n Co., Lockport, N. Y.

Aluminum Castings.
Aluminum Company of America, Pittsburg, Pa.
Aluminum Goods Mfg. Co., Newark, N. J.
Buermann, August, Newark, N. J.
Clum & Atkinson, Rochester, N. Y.
Light Foundry & Mfg. Co., Pottstown, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.

Aluminum Electrical Conductors.
Aluminum Company of America, Pittsburg, Pa.

Aluminum Filler
Reinhold Noflux Alum. Solder Co., Newark, N. J.

Aluminum, Granulated
U. S. Reduction Co., Chicago, Ill.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Aluminum Ingots.
Aluminum Company of America, Pittsburg, Pa.
American Smelting & Refining Co., Cincinnati, O.
American Metal Co., New York.
Birkenstein, S., & Sons, Chicago, Ill.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Guiterman, Rosenfeld & Co., New York.
Kemp, W. H., Co., New York.
Leavitt, C. W., & Co., New York.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.
U. S. Reduction Co., Chicago, Ill.

Aluminum Match Plates.
Goodale Co., The, Kalamazoo, Mich.
McPhee, Hugh, Tarrytown, N. Y.

Aluminum Powder, Leaf and Foil.
Kemp, W. H., Co., New York.

Aluminum Manufactured Goods, Sheet
(See also Metal Goods made to order.)
Aluminum Goods, Mfg. Co., Newark, N. J.

Aluminum Moldings and Extruded Shapes.
Aluminum Co. of America, Pittsburg, Pa.

Aluminum Rivets.
Hassall, John, Inc., Brooklyn, N. Y.
Kemp, W. H., Co., New York.

Aluminum Sheets, Rods and Wire.
Aluminum Company of America, Pittsburg, Pa.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Kemp, W. H., Co., New York.
Pilling Brass Co., Waterbury, Conn.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.
U. S. Reduction Co., Chicago, Ill.

Aluminum Solder (See Solder).

Aluminum Tubes.
Aluminum Company of America, Pittsburg, Pa.
Ellwood Ivins Tube Works, Philadelphia, Pa.
Kemp, W. H., Co., New York.

Ammeters and Voltmeters (See also Platers' Supplies).
Bristol Co., The, Waterbury, Conn.
Sangamo Electric Co., Springfield, Ill.

Amyl Acetate (See also Platers' Supplies).
McKesson & Robbins, New York.
Nickolas, G. J., & Co., Chicago, Ill.

Annealing Machines, Automatic
Bates & Peard Annealing Furnace Co., New York.

Anodes, Brass or Copper (See also Platers' Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Dow Chemical Mfg. Co., Mansfield, O.
Hanson & Van Winkle Co., Newark, N. J.
Hussey, C. G., & Co., Pittsburg, Pa.
Levett Manufacturing Co., Matawan, N. J.
Seymour Manufacturing Co., The, Seymour, Conn.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Anodes, Nickel (See also Platers' Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Dow Chemical Mfg. Co., Mansfield, O.
Hanson & Van Winkle Co., Newark, N. J.
Levett Manufacturing Co., Matawan, N. J.
McKesson & Robbins, New York.
Seymour Manufacturing Co., The, Seymour, Conn.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Anodes, Platinum (See also Platers' Supplies).
Bishop, J., & Co., Malvern, Pa.

Anodes, Silver (See also Platers' Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Jackson, John J., Newark, N. J.
Renziehausen, Wm. F., Co., Newark, N. J.

Anodes, Zinc (See also Platers' Supplies).
Grasselli Chemical Co., Cleveland, O.

Antimony Metal.
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Hendricks Bros., New York.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
Richards & Co., Boston, Mass.
U. S. Reduction Co., Chicago, Ill.

Assayers (See Chemists and Assayers).

Automatic Cock Grinder.
Turner Machine Co., Philadelphia, Pa.

Babbitt Metals.
American Manganese Bronze Co., New York.
American Smelting & Refining Co., Cincinnati, O.
Benson, H. K. & F. S., Glen Ridge, N. J.
Birkenstein, S., & Sons, Chicago, Ill.
Clum & Atkinson, Rochester, N. Y.
Merchant & Evans Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.

Balls, Steel, for Burnishing
Abbott Ball Co., Hartford, Conn.

Bassite.
Bassite Smelting & Mfg. Co., Cincinnati, O.

Bismuth.
Hendricks Brothers, New York.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
Richards & Co., Boston, Mass.

Blow Piping.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Kirk & Blum, Cincinnati, O.
Knickerbocker Company, Jackson, Mich.
Leiman Bros., New York.

Brass and Bronze Architectural Work.
Manhattan Brass Co., New York.

Brass and Bronze Covered Iron Tubes.
Phenix Tube Co., Brooklyn, N. Y.

Brass Castings.
American Manganese Bronze Co., New York.
Buermann, August, Newark, N. J.
Clum & Atkinson, Rochester, N. Y.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.

Brass Ingots.
American Manganese Bronze Co., New York.
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Genessee Metal Co., Rochester, N. Y.
Illinois Smelting & Refining Co., Chicago, Ill.
Merchant & Evans Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Taunton-New B'fd Copper Co., New Bedford, Mass.
Whipple & Choate, Bridgeport, Conn.
White & Bro., Inc., Philadelphia, Pa.

Brass, Bronze or Copper Sheet, Wire, Rod Etc.
American Manganese Bronze Co., New York.
Ansonia Brass & Copper Co., The, New York.
Benson, H. K. & F. S., Glen Ridge, N. J.
Bridgeport Brass Co., Bridgeport, Conn.
Buffalo Copper & Brass Rolling Mill, Buffalo, N. Y.
Hendricks Bros., New York.
Hussey, C. G., & Co., Pittsburg, Pa.
Manhattan Brass Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Pilling Brass Co., Waterbury, Conn.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Manufacturing Co., The, Seymour, Conn.
Taunton-New B'fd Copper Co., New Bedford, Mass.
Waterbury Brass Co., Waterbury, Conn.

Brass, Bronze or Copper Tubes.
Ansonia Brass & Copper Co., The, New York.
Bridgeport Brass Co., Bridgeport, Conn.
Buffalo Copper & Brass Rolling Mill, Buffalo, N. Y.
Ellwood Ivins Tube Works, Philadelphia, Pa.
Linton & Co., Providence, R. I.
Manhattan Brass Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Phenix Tube Co., Brooklyn, N. Y.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Manufacturing Co., The, Seymour, Conn.
Waterbury Brass Co., Waterbury, Conn.
Wells, A. H., Co., Waterbury, Conn.

Brass Goods, Plumbers'
Manhattan Brass Co., New York.

Brazing—Brass, Iron, Etc.
Morgan Manufacturing Co., Newport, R. I.

Britannia Metal.
Benson, H. K. & F. S., Glen Ridge, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Toothill, John, Rochelle Park, N. J.

Bronze Castings.
Buermann, August, Newark, N. J.

Bronze Ingots and Castings.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
American Manganese Bronze Co., New York.
Ansonia Brass & Copper Co., The, New York.
Clum & Atkinson, Rochester, N. Y.
Genesee Metal Co., Rochester, N. Y.
Naulty Smelting & Ref'g Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Taunton-New B'fd Copper Co., New Bedford, Mass.

Bronze Sheets, Wire, Rods, Etc. (See Brass, Bronze and Copper Sheets, etc.).

Bronze Tubes (See Brass, Bronze and Copper Tubes).

Brushes, Wire and Bristle (See also Foundry Supplies and Platers' Supplies).
American Oil & Supply Co., Newark, N. J.
Blumenthal, Hermann, New York.
Osborn Manufacturing Co., Cleveland, O.
Riehl Manufacturing Co., Cleveland, O.

Buckle Tongues.
Campbell-Warner Co., Middletown, Conn.

Buffing Compositions (See also Platers' Supplies).
American Tripoli Co., Seneca, Mo.

Buffing and Polishing Supplies (See Polishing and Buffing Machinery and Equipment).

Buffing and Polishing Wheels (See also Platers Supplies).
Divine Brothers Co., Utica, N. Y.

Burners, Fuel Oil or Gas (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Hawley Down Draft Furnace Co., Chicago, Ill.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Pangborn, Thomas W., Company, New York.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Burnishing Barrels (See also Platers' Supplies).
Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Oakville, Conn.
Globe Machine & Stamping Co., Cleveland, O.
Smith & Richardson, Attleboro, Mass.

Cabbaging Presses.
Famous Mfg. Co., East Chicago, Ind.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury Farrel Fdy. & Machine Co., Waterbury, Conn.

Cadmium, Metallic
Grasselli Chemical Co., Cleveland, O.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
Richards & Co., Boston, Mass.

Castings. (See also name of metal wanted).

Castings, Die
Finished Parts Mfg. Co., Newark, N. J.

Castings, Iron Machinery
Bliss Co., E. W., Brooklyn, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

CLASSIFIED INDEX OF ADVERTISEMENTS AND BUYERS' GUIDE

Chemicals (See Platers' Supplies).

Chemists and Assayers.
Detroit Testing Laboratory, Detroit, Mich.
Krom, L. J., New York.
Ledoux & Co., New York.
McKesson & Robbins, New York.
Renziehausen, Wm. F., Newark, N. J.

Chemists, Manufacturing
Ames, M., Glens Falls, N. Y.
Dow Chemical Mfg. Co., Mansfield, O.
Grasselli Chemical Co., Cleveland, O.
International Chemical Co., Camden, N. J.
Klipstein, A., & Co., New York.
McKesson & Robbins, New York.
Niagara Alkali Co., Niagara Falls, N. Y.
Roessler & Hasslacher Chemical Co., New York.
Swan & Finch Co., New York.

Chromium Bronze.
Naulty Smelting & Refining Co., Philadelphia, Pa.

Chucks, Spinning
Bliss, E. W., Co., Brooklyn, N. Y.
Pryibil, P., New York.
Schulz, Fritz A., Chicago, Ill.

Cock Grinder, Automatic
Turner Machine Co., Philadelphia, Pa.

Composition Metal Ingots and Castings.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
American Manganese Bronze Co., New York.
Eastern Metal & Refining Co., Boston, Mass.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
White & Bro., Inc., Philadelphia, Pa.

Composition Metal Tacks, Nails, Etc.
Hussey, C. G., & Co., Pittsburg, Pa.

Conveyors.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Company, New York.

Copper, Carbonate of
Detroit Foundry Supply Co., Detroit, Mich.
Levett Manufacturing Co., Matawan, N. J.

Copper Castings.
American Manganese Bronze Co., New York.
Reeves, Paul S., & Son, Philadelphia, Pa.

Copper Ingots.
American Metal Co., New York.
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Hendricks Brothers, New York.
Leavitt, C. W., & Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Taunton-New B'f'd Copper Co., New Bedford, Mass.
Vogelstein, L., & Co., New York.
White & Bro., Inc., Philadelphia, Pa.

Copper Nails and Tacks.
Hassall, John, Inc., New York.
Hussey, C. G., & Co., Pittsburg, Pa.
Scovill Manufacturing Co., Waterbury, Conn.
Taunton-New B'f'd Copper Co., New Bedford, Mass.

Copper Rivets.
Hassall, John, Inc., New York.
Hendricks Bros., New York.

Copper Sheets, Wire, Rods, Bolts, Etc. (See Brass and Copper Sheets, etc.).

Copper, Shot
Seymour Manufacturing Co., Seymour, Conn.

Copper, Sulphate of
Grasselli Chemical Co., Cleveland, O.

Copper Tubes (See Brass and Copper Tubes)

Core Compound (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Obermayer, S., & Co., Cincinnati, O.

Core Machines (See also Foundry Supplies).
Brown Specialty M'ch'y Co., Chicago, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
Nicholls, W. H., New York.
Pangborn, Thomas W., Company, New York.

Core Ovens (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Gehnrich, Hermann, New York.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Company, New York.
Rockwell Furnace Co., New York.
Smith, J. D., Foundry & Supply Co., Cleveland, O.
Stevens, Frederic B., Detroit, Mich.

Core Tapering Machines (See also Foundry Supplies).
Brown Specialty M'ch'y Co., Chicago, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Company, New York.

Cranes.
Detroit Foundry Supply Co., Detroit, Mich.

Crucibles, Platinum
Bishop, J., & Co., Malvern, Pa.

Crucibles, Stirrers, Stoppers, Nozzles, Etc. (See also Foundry Supplies).
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Gautier, J. H. & Co., Jersey City, N. J.
McCullough-Dalzell Crucible Co., Pittsburg, Pa.
Paige Retort & Crucible Co., Taunton, Mass.
Ross-Tacony Crucible Co., Philadelphia, Pa.
Taylor, R. J., Inc., Philadelphia, Pa.

Crushers, Cinder (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Farrell Foundry & Machine Co., Ansonia, Conn.
Moussette, O. J., Co., Brooklyn, N. Y.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Waterbury (Conn.) Farrell Foundry & Machine Co.

Cupror Metal.
Cupror Co., The, New York.

Cyanide of Potassium (See also Platers' Supplies).
Dow Chemical Mfg. Co., Mansfield, O.
McKesson & Robbins, New York.

Die-Castings.
Finished Parts Mfg. Co., Newark, N. J.

Dies, Sheet Metal Working
Baird Machine Co., Oakville, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Waterburry (Conn.) Farrel Foundry & Machine Co.

Draw Benches—Wire, Rod and Tube
Farrel Foundry & Machine Co., Ansonia, Conn.
Oliver, W. W. Mfg. Co., Buffalo, N. Y.
Torrington Mfg. Co., Torrington, Mass.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Drying-Out Machines.
Baird Machine Co., Oakville, Conn.
Torrington Mfg. Co., Torrington, Mass.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Smith & Richardson, Attleboro, Mass.

Drosses (See Metal Turnings, Drosses, etc.).

Dust Collectors.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Kirk & Blum, Cincinnati, O.
Knickerbocker Co., The, Jackson, Mich.
Leiman Bros., New York.
Pangborn, Thomas W., Company, New York.

Dynamos, Platers' and Galvanizers' (See also Platers' Supplies).
Backus & Lesser Co., New York.
Bennett-O'Connell Co., Chicago, Ill.
Bogue, Chas. J., Electric Co., New York.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Dow Chemical Mfg. Co., Mansfield, O.
Hanson & Van Winkle Co., Newark, N. J.
Levett Manufacturing Co., Matawan, N. J.
L'Hommedieu, C. L. & Sons, Chicago, Ill.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Electroplating, Coloring, Dipping, Etc.
American Toy & Novelty Co., Chicago, Ill.
Buermann, August, Newark, N. J.
Northern Ohio Mfg. & Refg. Works, Cleveland, O.

Emery. (See Platers' Supplies).

Emery Wheels, Flexible
American Oil & Supply Co., Newark, N. J.

Enameling Ovens.
Gehnrich, Herrmann, New York.
Rockwell Furnace Co., New York.
Steiner, E. E., Newark, N. J.

Engineers, Mechanical, Foundry, Etc.
Pangborn, Thomas W., Company, New York.
Smith, J. D., Foundry Supply Co., Cleveland, O.
Thompson, Hugh L., Waterbury, Conn.

Escutcheon Pins, All Metals
Hassall, John, New York.

Etched Name Plates.
Krizan & Hill, New York.
Schweizer, Max, Bridgeport, Conn.

Exhaust Fans.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Lederer, F. J., Co., Buffalo, N. Y.
Leiman Bros., New York.
Pangborn, Thomas W., Company, New York.

Expert Instruction—Plating, Coloring, Dipping Etching, Etc.
Proctor & Stremel, Arlington, N. J.
Schweizer, Max, Bridgeport, Conn.

Fire Brick (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Stevens, Frederic B., Detroit, Mich.

Flasks, Brass Molders' (See also Foundry Supplies).
McPhee, Hugh, Tarrytown, N. Y.
Middleditch, Benj., Detroit, Mich.
Nicholls, W. H., New York.
Osborn Mfg. Co., Cleveland, O.

Fluxes, Metal (See also Foundry Supplies).
Bassite Smelting & Mfg. Co., Cincinnati, O.
Cleveland Tensilite Co., Cleveland, O.

Fluxes, Soldering and Tinning
Grasselli Chemical Co., Cleveland, O.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Spice, The Alfred, Process, Philadelphia, Pa.

Forgings, Automobile
American Manganese Bronze Co., New York.
Bliss, E. W., Co., Brooklyn, N. Y.

Foundry Facings (See also Foundry Supplies).
Albany Sand & Supply Co., Albany, N. Y.
Detroit Foundry Supply Co., Detroit, Mich.
Dixon, Jos., Crucible Co., Jersey City, N. J.
McKesson & Robbins, New York.
Obermayer Co., The S., Cincinnati, O.
Stevens, Frederic B., Detroit, Mich.

Foundry Supplies and Equipment.
Albany Sand & Supply Co., Albany, N. Y.
Birkenstein S., & Sons, Chicago, Ill.
Brown Specialty Machinery Co., Chicago, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
Hawley Down Draft Furnace Co., Chicago, Ill.
Kroschell Bros. Co., Chicago, Ill.
McPhee, Hugh, Tarrytown, N. Y.
Middleditch, Benj., Detroit, Mich.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Nicholls, Wm. H., New York.
Obermayer Co., The S., Cincinnati, O.
Osborn Mfg. Co., Cleveland, O.
Pangborn, Thomas W., Company, New York.
Smith, J. D., Foundry Supply Co., Cleveland, O.
Stevens, Frederic B., Detroit, Mich.

Furnace Linings (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Rockwell Furnace Co., New York.
Stevens, Frederic B., Detroit, Mich.

Furnaces, Annealing, Brazing, Etc.
Bates & Peard Annealing Furnace Co., New York.
Detroit Foundry Supply Co., Detroit, Mich.
Leiman Bros., New York.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Furnaces, Electric
Bristol Co., The Waterbury, Conn.

Furnaces, Galvanizing and Tinning
Farrel Foundry & Machine Co., Ansonia, Conn.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Furnaces, Melting, for Oil, Coal, Coke, or Gas (See also Foundry Supplies).
Chicago Flexible Shaft Co., Chicago, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
Hawley Down Draft Furnace Co., Chicago, Ill.
Ideal Furnace Co., Chester, Pa.
Kroschell Bros. Co., Chicago, Ill.
Leiman Bros., New York.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Obermayer Co., The S., Cincinnati, O.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.
Wise, J. B., Watertown, N. Y.

Furnaces, Reverberatory
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Fuse l Oil, Refined (See also Platers' Supplies).
McKesson & Robbins, New York.
Nikolas, G. J., & Co., Chicago, Ill.

Gas Engines.
Otto Gas Engine Works, The, Philadelphia, Pa.

Gas Producers.
Otto Gas Engine Works, The, Philadelphia, Pa.

Galvanized Specialties, Nails, Screws, Etc.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Galvanizers' Equipment (See also Platers' and Polishers' Supplies).
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
Meaker Co., Chicago, Ill.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Galvanizing Barrels and Automatic Devices.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.
Globe Machine & Stamping Co., Cleveland, O.

Galvanizing for the Trade.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Galvanizing Plants.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
Meaker Co., Chicago, Ill.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

German Silver Ingots, Castings, Etc.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seymour Manufacturing Co., The, Seymour, Conn.

German Silver Sheets, Wire, Rods, Tubes, Etc.
Pilling Bros. Co., Waterbury, Conn.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Manufacturing Co., The, Seymour, Conn.
Waterbury Brass Co., Waterbury, Conn.

Gold Alloys.
Riverside Metal Co., Riverside, N. J.

Gold, Chloride of (See also Platers' Supplies).
Ames, M., Glens Falls, N. Y.

Gold Ingots, Bars, Plates, Etc.
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Graphite (See Foundry Supplies).

Grinding Wheels (See also Foundry Supplies).
American Oil & Supply Co., Newark, N. J.

CLASSIFIED INDEX OF ADVERTISEMENTS AND BUYERS' GUIDE

Grinding Machinery.
Bennett-O'Connell Co., Chicago, Ill.
Blake & Johnson Co., Waterbury, Conn.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Dow Chemical Mfg. Co., Mansfield, O.
Osborn Mfg. Co., Cleveland, O.
Schulz, Fritz A., Chicago, Ill.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Heat Gages.
Bristol Co., Waterbury, Conn.

Hoists, Electric, Pneumatic, Hand
Detroit Foundry Supply Co., Detroit, Mich.

Hydraulic Machinery, Jacks, Etc.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.

Iron, Scrap, Dealers in
Smith, The Morton B., New York.

Iron Tubes, Brass and Bronze Covered
Phoenix Tube Co., Brooklyn, N. Y.

Japanning Ovens.
Gehnrich, Hermann, New York.
Rockwell Furnace Co., New York.
Steiner, E. E., Newark, N. J.

Jewelers' Equipment and Supplies (See also Plater's Supplies).
American Oil & Supply Co., Newark, N. J.
Leiman Bros., New York.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.

Jewelers' Findings.
Smith & Richardson, Attleboro, Mass.

Kettles, Galvanizing and Tinning (See also Platers' Supplies).
Farrel Foundry & Machine Co., Ansonia, Conn.

Lacquer Enamels (See also Platers' Supplies).
Celluloid Zapon Co., New York.
Egyptian Lacquer Mfg. Co., New York.
Eureka Pneumatic Spray Co., New York.

Lacquering Ovens.
Gehnrich, Hermann, New York.
Steiner, E. E., Newark, N. J.

Lacquer Sprayers.
Eclipse Air Brush & Compressor Co., Bloomfield, N. J.
Eureka Pneumatic Spray Co., New York.
Lederer Co., F. J., Buffalo, N. Y.
Passche Air Brush Co., Chicago, Ill.

Lacquers, Metal (See also Platers' Supplies).
American Lacquer Co., Bridgeport, Conn.
Celluloid Zapon Co., New York.
Egyptian Lacquer Manufacturing Co., New York.
Eureka Pneumatic Spray Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Kalbfleisch, Franklin H., Co., New York.
New Era Lustre Co., New Haven, Conn.
Nikolas, G. J., & Co., Chicago, Ill.

Ladle Heaters and Dryers (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Hawley Down Draft Furnace Co., Chicago, Ill.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Pangborn, Thomas W., Co., Baltimore, Md.
Rockwell Furnace Co., New York.

Ladles (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.

Lathes, Polishing (See Platers' and Polishers' Supplies).

Lathes, Spinning, Turning, Etc.
American Tool & Machine Co., Boston, Mass.
Bliss, E. W., Co., Brooklyn, N. Y.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Pryibil, P., New York.
Schulz, Fritz A., Chicago, Ill.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Lathes, Turret
American Tool & Machine Co., Boston, Mass.

Lead, Antimonial
Leavitt, C. W., & Co., New York.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Lead Castings, Antimonial
Standard Rolling Mills Inc., Brooklyn, N. Y.

Lead, Pig and Bar
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Hendricks Bros., New York.
Illinois Smelting & Refining Co., Chicago, Ill.
Merchant & Evans Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.
U. S. Reduction Co., Chicago, Ill.
Vogelstein, L., & Co., New York.

Lubricants.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

Lycopodium. (See also Foundry Supplies).
Mckesson & Robbins, New York.

Mahogany Pattern Lumber.
Thompson & Co., Lewis, Philadelphia, Pa.

Manganese Bronze Ingots and Castings.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
American Manganese Bronze Co., New York.
Clum & Atkinson, Rochester, N. Y.
Electric Smelting & Alum. Co., Lockport, N. Y.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Taunton-New B'fd Copper Co., New Bedford, Mass.

Manganese Bronze Sheets, Rods, Etc.
American Manganese Bronze Co., New York.
Taunton-New B'fd Copper Co., New Bedford, Mass.

Manganese Copper.
American Metal Co., New York.
American Smelting & Refining Co., Cincinnati, O.
Electric Smelting & Alum. Co., Lockport, N. Y.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Roessler & Hasslacher Chemical Co., New York.

Manganese Metal.
Leavitt, C. W., & Co., New York.
Reeves, Paul S., & Son, Philadelphia, Pa.
Roessler & Hasslacher Chemical Co., New York.

Manganese Silicon.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.

Magnesium Aluminum.
Leavitt, C. W., & Co., New York.

Magnesium Metal.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
Roessler & Hasslacher Chemical Co., New York.

Magnetic Metal Separators (See also Foundry Supplies).
American Concentrator Co., Joplin, Mo.
Capitol Brass Works, Detroit, Mich.
Dings Electro-Mag. Separator Co., Milwaukee, Wis.
Pangborn, Thomas W., Company, New York.

Match Plates.
Goodale Co., The Kalamazoo, Mich.
McPhee, Hugh, Tarrytown, N. Y.
Middleditch, Benj., Detroit, Mich.

Metals (See name of metal wanted).

Metal Cleaning Compounds (See also Platers' Supplies).
Anthony, H. M., & Co., New York.
Dow Chemical Mfg. Co., Mansfield, O.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
International Chemical Co., Camden, N. J.
Stevens, Frederic B., Detroit, Mich.
Swan & Finch Co., New York.

Metal Fluxes (See also Foundry Supplies).
Bassite Smelting & Mfg. Co., Cincinnati, O.
Cleveland Tensilite Co., Cleveland, O.
Reeves, Paul S., & Son, Philadelphia, Pa.

Metallurgists, Consulting.
Detroit Testing Laboratory, Detroit, Mich.
Krom, L. J., New York.
Ledoux & Co., New York.

Metals, Dealers in all Kinds of New (See also name of metal wanted).
Andler, M. M., & Co., Boston, Mass.
Birkenstein, S., & Sons, Chicago, Ill.
Merchant & Evans Co., Philadelphia, Pa.
Moers, Albert A., New York.
Richards & Co., Boston, Mass.

Metals, Dealers in Old
Andler, M. M., & Co., Boston, Mass.
Birkenstein, S., & Sons, Chicago, Ill.
Genesee Metal Co., Rochester, N. Y.
Hofeller, Theodore, & Co., Buffalo, N. Y.
Illinois Smelting & Refining Co., Chicago, Ill.
Smith, The Morton B., Co., New York.
Riverside Metal Co., Riverside, N. J.

Metals, Dealers in Old—Gold, Silver, Platinum
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Metal Goods Made to Order.
Aluminum Goods Mfg. Co., Newark, N. J.
American Toy & Novelty Co., Chicago, Ill.
Ansonia Brass & Copper Co., New York.
Bridgeport Brass Co., Bridgeport, Conn.
Buermann, August, Newark, N. J.
Krizan & Hill, New York.
Manhattan Brass Co., New York.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Waterbury Brass Co., Waterbury, Conn.

Metal, Plated Sheet
Benson, H. K. & F. S., Glen Ridge, N. J.
National Sheet Metal Co., Peru, Ill.

Metal Refiners, Gold and Silver.
Genesee Metal Co., Rochester, N. Y.
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Metal Refiners—White Metal.
Birkenstein, S., & Sons, Chicago, Ill.
Reeves, Paul S., & Sons, Philadelphia, Pa.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Toothill, John, Rochelle Park, N. J.

Metal, Silver Plated Sheet
Benson, H. K. & F. S., Glen Ridge, N. J.

Metal Spinning. (See also Metal Goods made to order).
Detroit Metal Spinning Co., Detroit, Mich.
Riverside Metal Co., Riverside, N. J.

Metal Stamping. (See also Metal Goods made to order).
Detroit Metal Spinning Co., Detroit, Mich.
Globe Machine & Stamping Co., Cleveland, O.
Krizan & Hill, New York.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Metal Turnings, Drosses, Residue, Etc., Buyers of
Andler, M. M., Co., Boston, Mass.
Birkenstein, S., & Sons, Chicago, Ill.
Illinois Smelting & Refining Co., Chicago, Ill.
Smith, The Morton B., Co., New York.
Toothill, John, Rochelle Park, N. J.
Whipple & Choate, Bridgeport, Conn.
White & Bro., Inc., Philadelphia, Pa.

Mold Dryers, Portable (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Pangborn, Thomas W., Company, New York.
Rockwell Furnace Co., New York.

Mold Spraying Machines. (See also Foundry Supplies).
Pangborn, Thomas W., Company, New York.

Molds, Ingot (See also Foundry Supplies).
Farrel Foundry & Machine Co., Ansonia, Conn.
Leiman Bros., New York.
Nicholls, Wm. H., New York.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Molding Machines. (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Goodale Co., Kalamazoo, Mich.
McPhee, Hugh, Tarrytown, N. Y.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Turner Machine Co., Philadelphia, Pa.

Monel Metal Sheets.
Merchant & Evans Co., Philadelphia, Pa.

Muntz's Metal—Sheets, Rods, Bolts, Nails, Etc.
Taunton-New B'fd Copper Co., New Bedford, Mass.

Nails. (See name of metal wanted).

Name Plates, Etched
Krizan & Hill, New York.

Nickel.
Dow Chemical Mfg. Co., Mansfield, O.
Hanson & Van Winkle Co., Newark, N. J.
Hendricks Bros., New York.
Leavitt, C. W., & Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.

Nickel Castings.
Dow Chemical Mfg. Co., Mansfield, O.
Hanson & Van Winkle Co., Newark, N. J.

Nickel Salts. (See also Platers' Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Dow Chemical Mfg. Co., Mansfield, O.
Hanson & Van Winkle Co., Newark, N. J.
McKesson & Robbins, New York.

Nickel, Shot
Merchant & Evans Co., Philadelphia, Pa.
Seymour Manufacturing Co., Seymour, Conn.

Nickel Silver Tubes.
Wells, A. H., & Co., Waterbury, Conn.

Oil Pumps and Storage Tanks.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.

Oils, Tempering and Lubricating
McKesson & Robbins, New York.
Swan & Finch, New York.

Ovens. (See also Core, Lacquering, Enameling and Sherardizing Ovens).
Gehnrich, Hermann, New York.
Steiner, E. E., Newark, N. J.

Paint for Metals, Etc.
Woolsey, C. A., Co., Jersey City, N. J.

Parting Compounds. (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Stevens, Frederic B., Detroit, Mich.

Pattern Lumber, Mahogany
Thompson & Co., Lewis, Philadelphia, Pa.

Pattern Shop Supplies (See Foundry Supplies).

Patterns, Mounted
McPhee, Hugh, Tarrytown, N. Y.

Pewter.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Phosphor Bronze Ingots, Castings, Etc.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
Clum & Atkinson, Rochester, N. Y.
Illinois Smelting & Refining Co., Chicago, Ill.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seymour Mfg. Co., Seymour, Conn.

Phosphor Bronze Sheets, Wire, Rods, Etc.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Pilling Brass Co., Waterbury, Conn.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seymour Mfg. Co., Seymour, Conn.

Phosphor Copper.
American Smelting & Refining Co., Cincinnati, O.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Roessler & Hasslacher Chemical Co., New York.

Phosphor Tin.
American Smelting & Refining Co., Cincinnati, O.
Clum & Atkinson, Rochester, N. Y.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.

CLASSIFIED INDEX OF ADVERTISEMENTS AND BUYERS' GUIDE

Phosphorus. (See also Foundry Supplies).
General Chemical Co., Philadelphia, Pa.
McKesson & Robbins, New York.

Pickling Machines, Automatic
Bliss, E. W., Co., Brooklyn, N. Y.
Schmitz, August, Dusseldorf, Germany.
Torrington Manufacturing Co., Torrington, Conn.

Platers' Compound. (See also Platers' Supplies).
International Chemical Co., Camden, N. J.
Swan & Finch Co., New York.

Platers' Metal. (See also Platers' Supplies).
Kemp, W. H., New York.
Pilling Brass Co., Waterbury, Conn.

Platers', Polishers' and Galvanizers Equipment and Supplies.
Abbott Ball Co., Hartford, Conn.
American Oil & Supply Co., Newark, N. J.
Ames, M., Glens Falls, N. Y.
Anthony, H. M., Co., New York.
Automatic Buffing Machine Co., Buffalo, N. Y.
Backus & Leeser Co., New York.
Baird Machine Co., Oakville, Conn.
Bennett-O'Connell Co., Chicago, Ill.
Burns, E. Reed, Brooklyn, N. Y.
Canning, W., & Co., Birmingham, England.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Detroit Foundry Supply Co., Detroit, Mich.
Divine Bros. Co., Utica, N. Y.
Dow Chemical Manufacturing Co., Mansfield, O.
Globe Machine & Stamping Co., Cleveland, O.
Grasselli Chemical Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
International Chemical Co., Camden, N. J.
Klauder-Weldon Dy'g Mach. Co., Amsterdam, N. Y.
Klipstein, A., & Co., New York.
Leiman Bros., New York.
Levett Manufacturing Co., Matawan, N. J.
L'Hommedieu, C. F., & Sons, Chicago, Ill.
Meaker Company, Chicago, Ill.
McKesson & Robbins, New York.
Roessler & Hasslacher Chemical Co., New York.
Rockhill & Vietor, New York.
Roth Bros. Co., Chicago, Ill.
Smith & Richardson, Attleboro, Mass.
Stevens, Frederic B., Detroit, Mich.
Swan & Finch Co., New York.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Plating Barrels and Apparatus.
(See also Platers' Supplies).
Abbott Ball Co., Hartford, Conn.
Backus & Leeser Co., New York.
Baird Machine Co., Oakville, Conn.
Bennett-O'Connell Co., Chicago, Ill.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Dow Chemical Mfg. Co., Mansfield, O.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
Levett Manufacturing Co., Matawan, N. J.
L'Hommedieu, C. F., & Sons Co., Chicago, Ill.
Klauder-Weldon Dye'g Mach. Co., Amsterdam, N.Y.
Rockhill & Vietor, New York.
Smith & Richardson, Attleboro, Mass.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Platinum Alloys, Salts, Solutions.
Bishop, J., & Co., Malvern, Pa.

Platinum Ingots.
Guiterman, Rosenfeld & Co., New York.

Platinum Laboratory Ware.
Bishop, J., & Co., Malvern, Pa.

Platinum Manufactured Goods.
Bishop, J., & Co., Malvern, Pa.

Platinum Refiners.
Bishop, J., & Co., Malvern, Pa.

Platinum Scrap, Buyers of
Bishop, J., & Co., Malvern, Pa.
Roessler & Hasslacher Co., New York.

Platinum Sheets, Wire, Foil, Etc.
Bishop, J., & Co., Malvern, Pa.

Plumbago (See Graphite).

Polishing, Buffing and Burnishing Machinery and Appliances (See also Platers' Supplies).
Abbott, Ball Co., Hartford, Conn.
American Oil & Supply Co., Newark, N. J.
Automatic Buffing Machine Co., Buffalo, N. Y.
Backus & Leeser Co., New York.
Baird Machine Co., Oakville, Conn.
Bennett-O'Connell Co., Chicago, Ill.
Cleveland Blow Pipe Co., Cleveland, O.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Detroit Foundry Supply Co., Detroit, Mich.
Dow Chemical Mfg. Co., Mansfield, O.
Divine Bros. Co., Utica, N. Y.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
Kirk & Blum, Cincinnati, O.
Knickerbocker Co., Jackson, Mich.
Lederer, F. J., Co., Buffalo, N. Y.
Levett Manufacturing Co., Matawan, N. J.
Leiman Bros., New York.
L'Hommedieu, C. F., & Sons, Chicago, Ill.
Middleditch, Benj., Detroit, Mich.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Osborn Mfg. Co., Cleveland, O.
Pfleghar Hardware Sp'lty Co., New Haven, Conn.
Roth Bros., Chicago, Ill.
Schulz, Fritz A., Chicago, Ill.

Polishing Belts, Endless (See also Platers' Supplies).
Ames Sword Co., Chicopee, Mass.
Dow Chemical Mfg. Co., Mansfield, O.

Potash. (See also Platers' Supplies).
International Chemical Co., Camden, N. J.
Klipstein, A., & Co., New York.
McKesson & Robbins, New York.
Niagara Alkali Co., Niagara Falls, N. Y.

Presses, Bench and Foot
Baird Machine Co., Oakville, Conn.
Blake & Johnson Co., Waterbury, Conn.
Schulz, Fritz A., Chicago, Ill.
Shuster, The F. B., Co., New Haven, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Cabbaging
Famous Mfg. Co., East Chicago, Ind.
Farrel Foundry & Machine Co., Ansonia, Conn.
Schmitz, August, Dusseldorf, Germany.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

Presses, Coining
Bliss, E. W., Co., Brooklyn, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Drop
Bliss, E. W., & Co., Brooklyn, N. Y.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Power
Baird Machine Co., Oakville, Conn.
Blake & Johnson Co., Waterbury, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Foundry Co., Pittsburg, Pa.
Schmitz, August, Dusseldorf, Germany.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.

Pressure Blowers. (See also Foundry Supplies).
Eureka Pneumatic Spray Co., New York.
Lederer, F. J., Co., Buffalo, N. Y.
Leiman Bros., New York.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.

Pyrometers.
Bristol & Co., The, Waterbury, Conn.

Riveting Machines.
Shuster, The F. B., Co., New Haven, Conn.

Rivets—Brass, Aluminum, Etc.
Hassall, John, Inc., New York.
Hendricks Bros., New York.
Kemp, W. H., Co., New York.

Roll-Grinding Machines.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolls, Chilled and Sand
Blake & Johnson Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Fdy. & Machine Co., Pittsburg, Pa.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolls, Jewelers'
American Oil & Supply Co., Newark, N. J.
Leiman Bros., New York.
Oliver, W. W., Mfg. Co., The, Buffalo, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolling Mill Machinery.
Blake & Johnson Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Fdy. & Machine Co., Pittsburg, Pa.
Oliver, W. W., Mfg. Co., The, Buffalo, N. Y.
Schmitz, August, Dusseldorf, Germany
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rouge. (See Platers' Supplies).

Sand, Fire (See also Foundry Supplies).
Albany Sand & Supply Co., Albany, N. Y.
Detroit Foundry Supply Co., Detroit, Mich.
Pangborn, Thomas W., Company, New York.

Sand Blast Machinery and Equipment.
Leiman Bros., New York.
Nicholls, Wm. H., New York.
Obermayer Co., The S., Cincinnati, Ohio.
Pangborn, Thomas W., Company, New York.

Sand Blast Tumbling Barrels.
Pangborn, Thomas W., Company, New York.

Sand Mixing Machines.
(See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Pangborn, Thomas W., Company, New York.

Sand, Molding (See also Foundry Supplies).
Albany Sand & Supply Co., Albany, N. Y.
Detroit Foundry Supply Co., Detroit, Mich.
Pangborn, Thomas W., Company, New York.

Sand Sifters. (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Osborn Mfg. Co., Cleveland, O.
Pangborn, Thomas W., Company, New York.
Turner Machine Co., Philadelphia, Pa.

Saw Dust, Boxwood, for Drying Purposes.
(See also Platers' Supplies).
Dow Chemical Mfg. Co., Mansfield, O.
Sommers, John Faucet Co., Newark, N. J.

Sawdust Drying-out Boxes.
(See also Platers' Supplies).
Bennett-O'Connell Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Steiner, E. E., Newark, N. J.

Shears, Power
Bliss, E. W., Co., Brooklyn, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Fdy. & Machine Co., Pittsburg, Pa.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.

Sheet Metal Straightening, Cutting and Forming Machinery.
Baird Machine Co., Oakville, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Blake & Johnson Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Schmitz, August, Dusseldorf, Germany.
Shuster, The F. B., Co., New Haven, Conn.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Sherardizing. (See also Galvanizing).
Globe Machine & Stamping Co., Cleveland, O.

Sherardizing Ovens.
Gehnrich, Hermann, New York.
Globe Machine & Stamping Co., Cleveland, O.
Rockwell Furnace Co., New York.

Silicon.
American Smelting & Refining Co., Cincinnati, O
Leavitt, C. W., & Co., New York.

Silicon Copper.
American Smelting & Refining Co., Cincinnati, O.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Roessler & Hasslacher Chemical Co., New York.

Silver, Nitrate and Chloride of
(See also Platers' Supplies).
Ames, M., Glens Falls, N. Y.
Jackson, John J., Co., Newark, N. J.

Silver Ingots, Bars, Plates, Etc.
Renziehausen, Wm. F., Co., Newark, N. J.

Silver, Rolled Sterling
Jackson, John J., Co., Newark, N. J.
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Sivler Wire.
Jackson, John J., Co., Newark, N. J.

Smelters, Sweep
Renziehausen, Wm. F., Co., Newark, N. J.

Soap. (See also Platers' Supplies.
International Chemical Co., Camden, N. J.

Solder, Aluminum
Aluminum Company of America, Pittsburg, Pa.
American Solder Co., Boston, Mass.
Clum & Atkinson, Rochester, N. Y.
Janney, Steinmetz & Co., Philadelphia, Pa.
Kemp, W. H., Co., New York.
Reinhold Noflux Alum'm Solder Co., Newark, N. J.
Richards & Co., Boston, Mass.
U. S. Reduction Co., Chicago, Ill.

Solder, Brazing
American Smelting & Refining Co., Cincinnati, O.
Hussey, C. G., & Co., Pittsburg, Pa.
Linton & Co., Providence, R. I.
Merchant & Evans Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Shimer, H. M., & Co., Philadelphia, Pa.

Solder, Gold
Linton & Co., Providence, R. I.

Solder, Silver
Jackson, John J., & Co., Newark, N. J.
Linton & Co., Providence, R. I.

Solder, Tinners'
American Smelting & Refining Co., Cincinnati, O.
Merchant & Evans Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.

Spelter.
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Grasselli Chemical Co., Cleveland, O.
Hegeler Bros., Danville, Ill.
Hendricks Bros., New York.
Illinois Smelting & Refining Co., Chicago, Ill.
Illinois Zinc Co., Peru, Ill.
Leavitt, C. W., & Co., New York.
Mathiesen & Hegeler Zinc Co., La Salle, Ill.
New Jersey Zinc Co., The, New York.
Richards & Co., Boston, Mass.
Sandoval Zinc Co., Chicago, Ill.
U. S. Reduction Co., Chicago, Ill.
Vogelstein, L., & Co., New York.

Spinning Lathes.
Pryibil, P., New York.
Schulz, Fritz A., Chicago, Ill.

Spinning Sheet Metal.
Detroit Metal Spinning Co., Detroit, Mich.
Globe Machine & Stamping Co., Cleveland, O.
Krizan & Hill, New York.

Spraying Machines.
Eclipse Air Brush & Compressor Co., Bloomfield, N. J.
Eureka Pneumatic Spray Co., New York.
Lederer Co., F. J., Buffalo, N. Y.
Paasche Air Brush Co., Chicago, Ill.
Pangborn, Thomas W., Company, New York.

Sprue Cutters. (See also Foundry Supplies).
Middleditch, Benj., Detroit, Mich.
Nicholls, Wm. H., New York.
Shuster, The F. B., Co., New Haven, Conn.
Smith, J. D., Foundry Supply Co., Cleveland, O.
Turner Machine Co., Philadelphia, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.

CLASSIFIED INDEX OF ADVERTISEMENTS AND BUYERS' GUIDE

Stamping, Sheet Metal
Detroit Metal Spinning Co., Detroit, Mich.
Globe Machine & Stamping Co., Cleveland, O.
Krizan & Hill, New York.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Tacks. (See name of metal wanted).

Tanks, Electroplaters' (See also Platers' Supplies).
Chadwick-Boston Lead Co., Boston, Mass.
Corcoran, A. J., Inc., New York.
Dow Chemical Mfg. Co., Mansfield, O.
Hanson & Van Winkle Co., Newark, N. J.
Levett Manufacturing Co., Matawan, N. J.
Stearns, The A. T., Lumber Co., Boston, Mass.

Tin, Chloride of
Grasselli Chemical Co., Cleveland, O.

Tinning Machines.
Globe Machine & Stamping Co., Cleveland, O.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Tin, Pig, Bar and Block
American Smelting & Refining Co., Cincinnati, O
Birkenstein, S., & Sons, Chicago, Ill.
Hendricks Bros., New York.
Leavitt, C. W., & Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.
U. S. Reduction Co., Chicago, Ill.
Vogelstein, L., & Co., New York.

Tin, Sheet Block
Merchant & Evans Co., Philadelphia, Pa.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Toothill, John, Rochelle Park, N. J.

Tramrails. (See also Foundry Supplies).
Rockwell Furnace Co., New York.

Tripoli Flour, Stone, Filters, Etc. (See also Platers' Supplies).
American Tripoli Co., Seneca, Mo.
Detroit Foundry Supply Co., Detroit, Mich.
Dow Chemical Mfg. Co., Mansfield, O.
McKesson & Robbins, New York.

Trolley Systems.
Nicholls, Wm. H., New York.

Tubes. (See name of metal wanted).

Tumbling Barrels. (See also Foundry Supplies and Platers' Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Middleditch, Benj., Detroit, Mich.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Pangborn, Thomas W., Company, New York.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Type Metal.
American Smelting & Refining Co., Cincinnati, O
Illinois Smelting & Refining Co., Chicago, Ill.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Vibrators. (See also Foundry Supplies).
Nicholls, Wm. H., New York.

Wax Wire. (See also Foundry Supplies).
Stevens, Frederic B., Detroit, Mich.

White Metal Castings.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Toothill, John, Rochelle Park, N. J.

White Metal Rolling for the Trade.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Toothill, John, Rochelle Park, N. J.

Wire. (See name of metal wanted).

Wire Goods Manufacturers.
Baird Machine Co., Oakville, Conn.
Campbell-Warner Co., Middletown, Conn.

Wire Mill Equipment.
Blake & Johnson Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Wire Nails, All Metals.
John Hassall, Inc., New York.

Wire Straightening and Forming Machinery.
Baird Machine Co., Oakville, Conn.
Blake & Johnson Co., Waterbury, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Pangborn, Thomas W., Company, New York.
Shuster, The F. B., Co., New Haven, Conn.

Wire Wheel and Hand Brushes. (See also Foundry Supplies).
Blumenthal, Hermann, & Co., New York.
Osborn Mfg. Co., Cleveland, O.
Riehl Manufacturing Co., Cleveland, O.

Zinc Battery Plates.
Grasselli Chemical Co., Cleveland, O.
Matthiesen & Hegler Zinc Co., La Salle, Ill.

Zinc, Chloride of (See also Platers' Supplies).
Grasselli Chemical Co., Cleveland, O.
Richards & Co., Boston, Mass.
Sandoval Zinc Co., St. Louis, Ill.

Zinc Dust (See also Platers' Supplies).
Globe Machine & Stamping Co., Cleveland, O.
Grasselli Chemical Co., Cleveland, O.
Klipstein, A., & Co., New York.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.

Zinc Salts, Commercial (See also Platers' Supplies).
Dow Chemical Mfg. Co., Mansfield, O.
Sandoval Zinc Co., East St. Louis, Ill.

Zinc Sheet and Plate.
Illinois Zinc Co., Peru, Ill.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.
Merchant & Evans Co., Philadelphia, Pa.
National Sheet Metal Co., Peru, Ill.
Pilling Brass Co., Waterbury, Conn.
Richards & Co., Boston, Mass.
Platt Bros. Co., Waterbury, Conn.

ALPHABETICAL INDEX OF ADVERTISERS

FOR INDEX TO ADVERTISEMENTS SEE PAGE 58